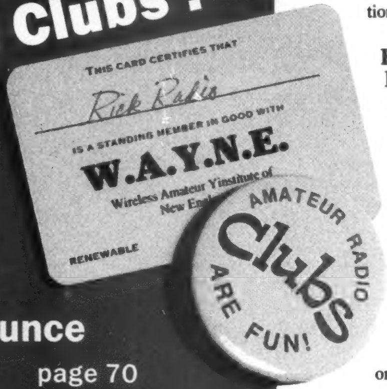
WIN A KENWOOD TM-2570A! (see page 97)

73 Amateur Radio

Issue #310
July 1986
USA $2.95
CAN $3.95

A WGE Publication

Close-Up On Clubs !



C-64 Keybounce Cure page 70

How To Test Transistors page 58

Dayton In Pictures page 16

Introducing: Kit Corner page 64

Easy RTTY Tuning Scope page 28

New! Tear Out Awards Section page 107

0 74820 08725 07

Table of Contents

Dayton '86
Capture the excitement (and the exhaustion!) of the Dayton Hamvention in pictures. . . . . Staff 16

How To Build A Great Ham Club
Fatherly advice on how to strengthen even the wimpiest of groups. W2NSD/1 26

Roll A RTTY Scope
A project for the purist—this tuning indicator has a built-in CRT WA0MRG 28

Bozo And the B-Hunt
Light a fire under your repeater group! Send them off on a wild goose chase! WD6R 36

HAMS Against Drunk Driving
How your club can aid in the fight against drunk drivers. KB6HQS 38

The Piggy-Bank Patch
In this follow-up to "The Piggy-Bank Repeater Project," you'll discover how to build an add-on autopatch for the original controller. KT2B 40

Future Hams of America
Find out what happens when 8,000 people are introduced to ham radio all at once!. . . .Azzalina 44

Publish Or Perish
From what to put in to where to put it, here's your guide to publishing a club newsletter. N1BLH 48

Genius Brings Home the Bacon
Seven years later, the Mobius antenna takes on a new twist. . . . . Phenix 52

Administering the Novice Exam
The simple steps to take when bringing a Novice into the fold. WF6P 56

Troubleshooting With the DMM
A step-by-step guide to tracking down rotten transistors and diodes using a digital multimeter. . . . . Davidson 58

Kit Corner: the DSE Radio Direction Finder
An introduction to the art of kit building. . . . . Swain 64

C-64 S-s-s-tutter Fix
This is a guaranteed, sure-fire cure for keybounce. WA4BLC 70

Departments

95	Above and Beyond	20	New Products	82	RTTY Loop
92	Barter 'N' Buy	88	NK6K⟩Packet	102	Satellites
93	Contests	110	Propagation	98	*73* International
102	Corrections	83	QRP	76	Special Events
110	Dealer Directory	7	QRX		
80	Feedback	10	QSL		
90	Fun!				
107	Ham Awards				
79	Ham Help				
17	Letters				
81	List of Advertisers				
87	Looking West				
4	Never Say Die				

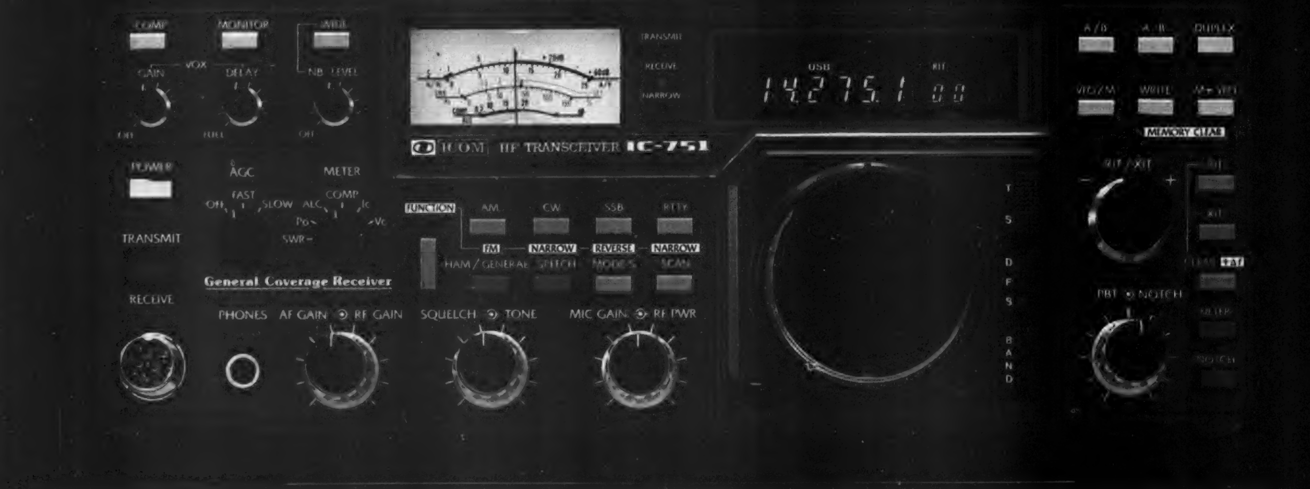
Reviews

Slight of Hand: Kenwood's TH-31AT hand-held. KT2B 22

The HD-3030, Heathkit's RTTY/CW interface. N1BLH 23

ICOM HF Transceiver

IC-751


COMP
MONITOR
WIDE
VOX
GAIN
DELAY
NB LEVEL
TRANSMIT
RECEIVE
NARROW
USB
RIT
14.275.1 00
A/B
A=B
DUPLEX
VFO/M
WRITE
M▸VFO
MEMORY CLEAR
ICOM HF TRANSCEIVER IC-751
POWER
AGC
FAST
SLOW
OFF
METER
COMP
ALC
Ic
Po
Vc
SWR
TRANSMIT
FUNCTION
AM
CW
SSB
RTTY
FM
NARROW
REVERSE
NARROW
HAM/GENERAL
SPEECH
MODE-S
SCAN
General Coverage Receiver
RIT/XIT
PBT NOTCH
RECEIVE
PHONES
AF GAIN
RF GAIN
SQUELCH
TONE
MIC GAIN
RF PWR
TS
DFS
BAND

The Standard of Excellence in HF Base Stations

The IC-751 is the most advanced transceiver available today. It's a competition grade ham receiver, a 100KHz to 30MHz continuous tuning general coverage receiver AND a full-featured all mode solid-state ham band transmitter. The IC-751 also covers the new WARC bands, MARS frequencies, and is AMTOR compatible.

Important Standard Features. Compare these important standard features in this "top of the line" base station:

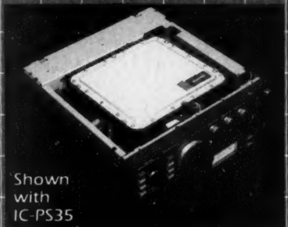
- 100KHz – 30MHz Receiver
- 105dB dynamic range
- QSK — full break-in CW
- FM Mode Standard
- High-grade FL-44A 455KHz SSB filter
- 32 tunable Memories with lithium battery backup
- 100% Duty Cycle Transmitter
- Passband Tuning
- 12V DC operation
- Adjustable AGC
- Adjustable Noise Blanker
- RIT/XIT with separate readout
- IC-HM12 Microphone with Up/Down Scan
- Continuously adjustable transmit power

Options. IC-EX310 speech synthesizer, internal IC-PS35 power supply, external IC-PS15 or IC-PS30 system supply, IC-SM8 two-cable desk mic, IC-SM6 desk mic, RC-10 external controller, and a variety of filters.

FILTER SPECIFICATIONS

Filter	Model	Center Freq. (KHz)	-6dB (KHz) Width
STANDARD FILTERS			
AM Ceramic	CFW 455 IT	455	6.0
SSB (PBT) XTAL	FL-30	9011.5	2.3
FM Filter	9M15A	9011.5	15 (-3dB)
SSB Narrow (Hygrade Crystal)	FL-44A	455	2.4
OPTIONAL FILTERS			
CW Narrow	FL-52A	455	0.500
CW Narrow	FL-53A	455	0.250
SSB Wide	FL-70	9011.5	2.8
CW Narrow	FL-32	9010.6	0.500
CW Narrow	FL-63	9010.6	0.250
AM	FL-33	9010.0	6.0

Operating From 12V, the IC-751 is also available with an optional internal AC power supply, the IC-PS35...for the winning edge in field day competition.


Shown with IC-PS35

The IC-751 provides superior performance for all amateur radio operators...from novice to extra class. See the IC-751 at your local ICOM dealer.

Now with a ONE YEAR Warranty!

ICOM

First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 751185

NEW ATLANTA STORE! EASY SERVICE FOR OUR EASTERN CUSTOMERS

HAM RADIO OUTLET

LARGEST HAM OUTLET IN THE WORLD

7 STORE BUYING POWER

ICOM IC-R71A

Superior Grade General Coverage Receiver

SALE! CALL FOR PRICE

ICOM IC-3200A

DUAL BANDER

Covers Both 2 Meters & 70 cm

LATEST EDITION

ICOM IC-1271A

1.2 GHz Transceiver: The First Full-featured 1240-1300 MHz Transceiver

AT GREAT LOW, LOW PRICES

ICOM IC-28A/28H

NEW

2-METER MOBILES

IC-28A (25w) IC-28H (45w)

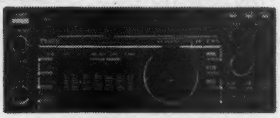
SPECIAL NEW PRICE!

NOW! RAPID DELIVERIES FROM OUR OUTLETS

COAST TO COAST

To Our Customers

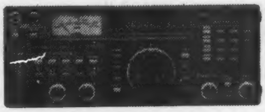
ICOM IC-735



The Latest in ICOM's Long Line of HF Transceivers

CALL FOR LOW, LOW PRICE

ICOM IC-R7000



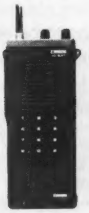
25 MHz-1300 MHz

IN STOCK FOR IMMEDIATE DELIVERY

ICOM HAND-HELDS

VHF/UHF

IC-02AT
IC-04AT

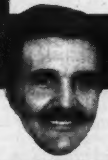


IC-2AT
IC-4AT

IC-3AT

WE SHIP DIRECT TO YOU FROM ANY ONE OF OUR NATIONWIDE OUTLETS.

All Major Brands in Stock Now!



Bob Ferrero W6RJ
President
Jim Rafferty N6RJ
VP So. Calif Div.
Anaheim Mgr.

ANAHEIM, CA 92801
2620 W. La Palma
(714) 761-3033, (213) 860-2040
Between Disneyland &
Knotts Berry Farm

ATLANTA, GA 30340 NEW
6071 Buford Hwy.
(404) 263-0700
Neil, Mgr. KC4MJ
Doraville, 1 mi. north of I-285

BURLINGAME, CA 94010
999 Howard Ave.
(415) 342-5757
George, Mgr. WB6DSV
5 miles south on 101 from SFO

OAKLAND, CA 94606
2210 Livingston St.
(415) 534-5757
Joe, Mgr. K5OS
17N-5th Ave./17S-16th Ave.

PHOENIX, AZ 85015
1702 W. Camelback Rd.
(602) 242-3515
Bob, K7RDH
East of Hwy. 17

SAN DIEGO, CA 92123
5375 Kearny Villa Rd.
(619) 560-4900
Glenn, Mgr. K6NA
Hwy. 163 & Claremont Mesa Blvd.

VAN NUYS, CA 91401
6265 Sepulveda Blvd.
(818) 988-2212
Al, Mgr. K6YRA
San Diego Fwy.
at Victory Blvd.

STORE HOURS
10 AM-5:30 PM
CLOSED SUNDAYS

FREE SHIPMENT

CALL TOLL FREE (800) 854-6046

MasterCard

Toll free including Alaska & Hawaii. Phone Hrs: 7:00 a.m. to 5:30 p.m. Pacific Time. California and Arizona customers call or visit nearest store. California and Arizona residents please add sales tax. Prices, specifications, descriptions subject to change without notice.

VISA

THINGS TO LOOK FOR *(AND LOOK OUT FOR)* IN A PHONE PATCH

- One year warranty.
- A patch should work with any radio. AM, FM, ACSB, relay switched or synthesized.
- Patch performance should not be dependent on the T/R speed of your radio.
- Your patch should sound just like your home phone.
- There should not be any sampling noises to distract you and rob important syllables. The best phone patches do not use the cheap sampling method. (Did you know that the competition uses VOX rather than sampling in their $1000 commercial model?)
- A patch should disconnect automatically if the number dialed is busy.
- A patch should be flexible. You should be able to use it simplex, repeater aided simplex, or semi-duplex.
- A patch should allow you to manually connect any mobile or HT on your local repeater to the phone system for a fully automatic conversation. Someone may need to report an emergency!
- A patch should not become erratic when the mobile is noisy.
- You should be able to use a power amplifier on your base to extend range.
- You should be able to connect a patch to the MIC and EXT. speaker jack of your radio for a quick and effortless interface.
- You should be able to connect a patch to three points inside your radio (VOL high side, PTT, MIC) so that the patch does not interfere with the use of the radio and the VOL. and SQ. settings do not affect the patch.
- A patch should have MOV lightning protectors.
- Your patch should be made in the USA where consultation and factory service are immediately available. **(Beware of an inferior offshore copy of our former PRIVATE PATCH II.)**

ONLY
PRIVATE PATCH III
GIVES YOU ALL
OF THE ABOVE

PRIVATE PATCH III

SIMPLEX SEMI-DUPLEX INTERCONNECT

POWER
OFF
CONNECT
DISCONNECT
DIAL RESTRICT
OFF
Private Patch III
SIMPLEX/SEMI-DUPLEX INTERCONNECT

The telephone is the most powerful mode of communications... PRIVATE PATCH III gives you full use of your home telephone from your mobile and HT radios!

With only three simple connections to your base station radio, PRIVATE PATCH III will give you more communications power per dollar than you ever imagined possible.

Suddenly the utility of your radio is drastically increased. There are new sounds . . . dial tones, ring tones, CW ID and the sound of voices you never expected to hear on your mobile or HT radio! What a convenience!

PRIVATE PATCH III frees you from memberships, cliques and other hassles common to many repeater autopatches. You can call who you want, when you want and for as long as you want. You can even receive your incoming calls!

VOX . . . the right choice!

VOX based phone patches offer many performance and operational advantages over the sampling method. These include operation through repeaters, compatibility with any radio, no lost words or syllables, greater range, smooth audio free of continual noise bursts, etc., etc.

Most amateurs are not aware that the competition's top of the line patch is VOX based. (You know . . . the $1000 model they enthusiastically call **"our favorite commercial simplex patch"** on page 3 of their SP brochure.)

PRIVATE PATCH III offers about the same capability, performance and features as their top model but is priced closer to their bottom of the line (SP) model!

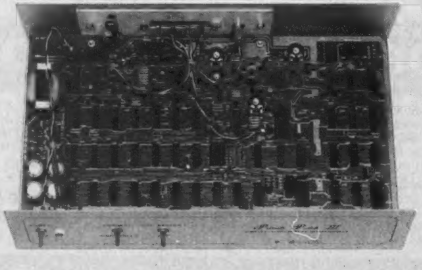
So why settle for SP when top of the line costs little more?

To Learn more about PRIVATE PATCH III and the advantages of the VOX concept, call or write for our four page brochure today!

PARTIAL LIST OF FEATURES

• **OPERATES SIMPLEX, THROUGH REPEATERS, OR DUPLEX ON REPEATERS** • **VOX BASED** • **TOLL RESTRICT** (Digit counting and programmable first digit lockout) • **SECRET CODE DISABLES TOLL RESTRICT FOR ONE TOLL CALL**—Automatic re-arm • **AUTOMATIC BUSY SIGNAL DISCONNECT** • **CONTROL INTERRUPT TIMER** (Maintains positive mobile control) • **CW ID** When you connect again on disconnect. Free ID chip. • **SELECTABLE TONE OR PULSE DIALING** • **MOV LIGHTNING PROTECTORS** • **THREE DIGIT ACCESS CODE** (e.g. ✱91) • **RINGOUT** (Reverse patch) Ringout inhibit if channel busy. • **RESETTABLE THREE MINUTE TIMER** • **SPARE RELAY POSITION** • **115VAC SUPPLY**

Options:
FCC approved coupler
12 VDC or 230 VAC power



✓12

DEALERS

AMATEUR ELECTRONIC SUPPLY
Milwaukee WI, Wickliffe Oh, Orlando FL, Clearwater FL, Las Vegas NV

BARRY ELECTRONICS CORP.
New York, NY

COLES COMMUNICATIONS
San Antonio TX

EGE, INC.
Woodbridge, VA

ERICKSON COMMUNICATIONS
Chicago IL

HAM RADIO OUTLET
Anaheim CA, Burlingame CA, Oakland CA, Phoenix AZ, San Diego CA, Van Nuys CA

HENRY RADIO
Los Angeles CA

INTERNATIONAL RADIO SYSTEMS
Miami, FL

JUNS ELECTRONICS
Culver City CA

MADISON ELECTRONICS SUPPLY
Houston, TX

MIAMI RADIO CENTER CORP.
Miami FL

MIKES ELECTRONICS
Ft. Lauderdale, Miami FL

N&G DISTRIBUTING CORP.
Miami FL

PACE ENGINEERING
Tucson AZ

THE HAM STATION
Evansville IN

TEXAS TOWERS
Plano, TX

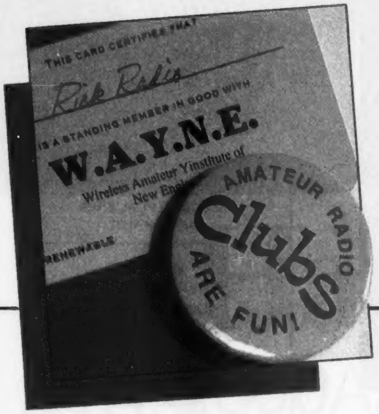
TNT RADIO SALES
Robbinsdale, MN

WESTCOM
San Marcos, CA

CANADA:
DOLLARD ELECTRONICS
Vancouver, BC

SKYWAVE RADIO SYSTEMS, LTD.
Burnaby, B.C.

CONNECT
SYSTEMS
INCORPORATED 23731 Madison St., Torrance, CA 90505
(213) 373-6803



73® Amateur Radio

ISSUE #310

JULY 1986

Focus On Clubs

How To Build A Great Ham Club 26

Not only is this the first article in this month's issue (not, of course, because it was written by the Boss), it sets the theme for our focus on clubs. Why are so many clubs going down the tubes? What can be done to increase the level of enthusiasm in yours? There's no sure-fire formula for success, but there are a few key concepts that must be understood before a club will really take off. Here are those concepts.

Bozo and the B-Hunt 36

No, not the clown. We can't tell you what this article is about without giving away the punch line, so let's just say that your club's repeater might be the prime ingredient in an insanely fun club activity! (For those of you who can't wait to get to page 36, here's a clue: *The music stopped, the lady died.*)

HAMS Against Drunk Driving 38

It stands for the Highway Amateur Monitoring System, a program designed to involve ham clubs in the fight against drunk driving. You certainly can't get any more public-service oriented than that. Use the ideas presented here to form a HAMS unit in your home town.

Future Hams of America 44

This is an example of what a club can do when *everybody* pitches in! The Council of Eastern Massachusetts Amateur Radio Clubs (CMARC) wouldn't settle for a ho-hum mall demonstration: They invaded the Boston Museum of Science and introduced 8,000 people to the excitement of ham radio! Here's how they did it, and how *your* club can do it, too!

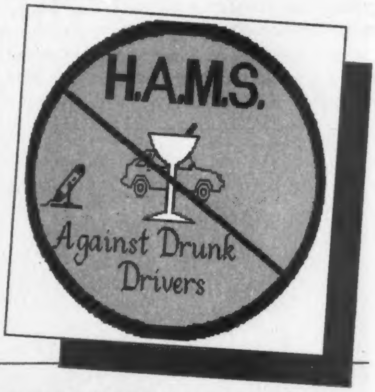
Publish Or Perish 48

Look, we read about 150 club newsletters every month as part of *73*'s Newsletter of the Month contest. Believe it, if your club publishes a newsletter, you need to read this piece by N1BLH. In it you'll discover what makes a great newsletter great, where to get material, what sort of layout to use . . . in short, everything that you need to know to publish a dynamite newsletter. (Past winners of the NOTM award may skip to the next article.)

Introducing: Kit Corner

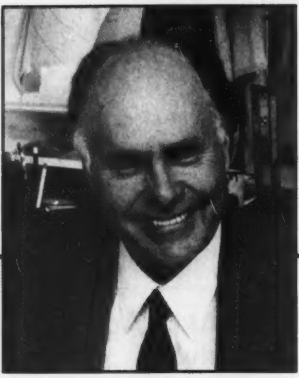
The DSE Radio Direction Finder 64

We're trying something new here, a cross between a construction article and a review. The idea is to introduce you to all of the various kits that you can build, with the hope that you will start building them. Dick Smith's RDF is a clever little gizmo which electronically rotates four whips at 1,250 rpm to determine the bearing to a transmitter; the bearing is displayed on a 32-LED compass rose.



Editorial Offices: WGE Center, Peterborough NH 03458-1194, phone: 603-525-4201. **Advertising Offices:** WGE Center, Peterborough NH 03458-1194. **Circulation Offices:** WGE Center, Peterborough NH 03458-1194, phone : 603-525-4201. **Manuscripts:** Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts. **Subscription Information:** Rates: in the United States and Possessions: One Year (12 issues) $24.97; Two Years (24 issues) $45.47. Elsewhere: Canada and Mexico—$39.00/1 year only , US funds. Foreign surface mail—$45.00/1 year only, US funds drawn on US bank. Foreign air mail—please inquire. To subscribe, renew or change an address: Write to Subscription Department, PO Box 931, Farmingdale NY 11737. Send Canadian changes of address to: *73*, PO Box 1051, Fort Erie, Ontario CANADA L2A 5N8. Return postage guaranteed. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients. For questions concerning your subscription and to place subscription orders, please call us toll free at 1-800-645-9559 between 9 am and 5 pm or write to *73*, Subscription Department, PO Box 931, Farmingdale NY 11737. ***73 Amateur Radio*** (ISSN 0745-080X) is published monthly by WGE Publishing, WGE Center, Peterborough NH 03458-1194. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Canadian second class mail registration number 9566. Entire contents copyright © 1986, WGE Publishing. All rights reserved. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher. Microfilm Edition—University Microfilm, Ann Arbor MI 48106. **Postmaster:** Send address changes to *73 Amateur Radio*, Subscription Services, PO Box 931, Farmingdale NY 11737. Nationally distributed by International Circulation Distributors. **Contract Liability:** The mere glancing at this binding reader contract constitutes total acceptance on your part of the contract provisions and terms hereunto enumerated. Too bad if you looked. Read this out loud: "I do hereby swear that I will be a true and loyal subscriber to *73* Magazine—that I will, without failure, diligently mark the Reader Service card indicating the information I need to improve my station—that upon receiving the requested information I will select and order the equipment I need to pursue a new facet of my beloved hobby—further, recognizing my egregious faults, I agree to turn over a new leaf and become a much better amateur operator." The above is binding even if spoken sotto voce—I saw you move your lips, so no weaseling out. By the way, you mispronounced "egregious." Can't you do anything right? Atone. A simple abject apology on the border of the Reader Service card will suffice. This'll teach you to read the fine print.

NEVER SAY DIE



WHY WEREN'T YOU THERE?

Just about everyone in amateur radio who's been doing anything more than rag-chewing what's left of their lives away turned out for Dayton again this year. It was mobbed, as usual.

No matter how many cavernous buildings they add to the Hara Arena, the manufacturers and ham dealers seem able to fill 'em up. One reason for the action is the whipsawing of dealers by hordes of unscrupulous hams dashing back and forth, getting ever lower ham gear prices. Dealers are faced with the choice of making a dollar or two or not making the sale. The prospect of packing up all that stuff and trucking it back to the store a couple states away eventually makes even a small loss on the sale attractive.

One result of this has been the gradual disappearance of many larger ham dealers as exhibitors.

Our hobby, as you know, is in reality a whole bunch of related hobbies . . . DXing, packet, repeaters, meteor scatter, moonbounce, service nets, QRP, certificate hunting, SSTV, RTTY, and so on. Dayton has become the mecca for these ham splinter hobbies—a place where the annointed are able to get together every year and outlie each other.

It's also heaven for the dedicated scrounger. The flea market area sells out completely—acres of surplus equipment going back at least to WWII. Come to think of it, the surplus WWI gear seems to have stopped showing up. When I was getting started in the hobby the surplus stores on Canal Street in New York still had piles of WWI radio surplus.

I wandered out into the flea market with an idea of awarding a prize for the most useless piece of junk I could find. In no time I had so many top contenders for the award I had to give it up. I did note a definite drop in Heath Twoers on display, thank heavens.

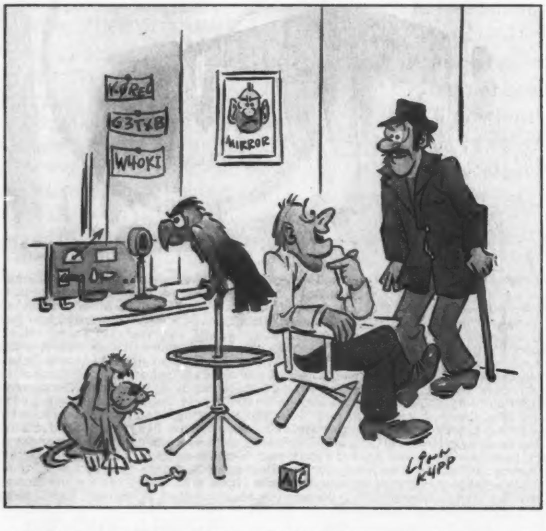
I would like to personally thank everyone who took the time to stop at the *73* booth and say hello, wishing me luck with the magazine. My apologies to the several thousand more who missed me while I was seeing the other exhibits.

One thing really worries me though. Unless we have some success in getting our hobby growing again—which depends entirely on YOU—we're looking at a rapidly shrinking hobby. This means that unless you take very good care of yourself, we're going to run out of hams. I was dismayed at the number of you I saw who are recklessly ruining your most important possession—your body. Lordy, I saw great big fat guts hanging out all over the place—beer bellies by the thousands. Many hams, knowing my feelings about smoking, put 'em out before saying hello. But I want you to know I was out there watching you . . . I saw you light up again after leaving my booth. Do you really need someone to hit you over the head to get you to make up your mind to stop smoking?

You know as well as I do that smoking is killing you, slowly but surely. It's working on you, preparing you for heart trouble, cancer, emphysema, and dozens of other exceedingly painful slow-death illnesses. My father smoked for fifty years, swearing nothing would ever make him stop. When he began passing out now and then he sure stopped—and lived on twenty years more. But the last few years were hell. His emphysema got so bad he couldn't breathe without an oxygen tank. He couldn't walk more than a few feet, even with oxygen. It's something to think about as you reflexively pull out another cigarette and light up.

Of course if you don't mind giving up about ten years of your life for the pleasure of smoking . . .

Continued on page 10



"I don't do anything much! He calls CQ and answers all questions!"

STAFF

PUBLISHER
Wayne Green W2NSD/1

ASSOCIATE PUBLISHER
Stuart Norwood

EDITOR
Perry Donham KW1O

MANAGING EDITOR
Chris Schmidt KA1MPL

PRODUCTION EDITOR
Steve Jewett KA1MPM

INTERNATIONAL EDITOR
Richard Phenix

COPY EDITOR
Robin Florence

EDITORIAL ASSISTANT
Carole Macioci

ART DIRECTOR
Dianne Ritson

DESIGNER
Susan Hays

ASSOCIATES
Robert Baker WB2GFE
John Edwards KI2U
Bill Gosney KE7C
Jim Gray W1XU
Dr. Marc Leavey WA3AJR
Bill Pasternak WA6ITF
Harold Price NK6K
Peter Putman KT2B
William Stocking W0VM

ADVERTISING
1-603-525-4201
1-800-722-7790

SALES MANAGER
Nancy Ciampa

ADVERTISING SALES
Penny Brooks KA1GAW

MARKETING MANAGER
Hope Currier

WGE PUBLISHING, INC.

PUBLICATIONS DIRECTOR
James S. Kendrick

OPERATIONS MANAGER
David P. Raether

PRODUCTION SUPERVISOR
Bruce Hedin

PRINTING SERVICES MANAGER
Tedd A. Cluff

SYSTEMS MANAGER
Sara B. Philbin

TYPESETTING/PAGINATION
Bob Dukette, Mike Thompson

GRAPHICS SERVICES
Sue B. Flanagan, Dan Croteau,
Liz McGrath, Cindy Pirkey

CIRCULATION MANAGER
Kristin Joslin

Editorial Offices
WGE Center
Peterborough, NH 03458-1194
603-525-4201

Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio **(ISSN 0745-080X) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.** **Entire contents © 1986 by WGE Publishing, Inc. No part of this publication may be reproduced without written permission from the publisher.**

KENWOOD

...pacesetter in Amateur radio

Handy Handful...

TR-2600A/3600A

Kenwood's TR-2600A and TR-3600A feature DCS (Digital Code Squelch), a new signalling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different DCS combinations possible.

LOW
TONE
MIC
SP
REV
PWR/OFF
VOL
SQL

- **Simple to operate**
  Functional design is "user friendly." Built-in 16-key autopatch encoder, TX STOP switch, REVerse switch, KEYboard LOCK switch, high efficiency speaker.
- **Large LCD**
  Easy to read in direct sunlight or in the dark with convenient dial light that also illuminates the top panel S-meter.
- **Extended frequency coverage**
  Allows operation on most MARS and CAP frequencies. Receive frequency range is 140-160 MHz. (TR-3600A covers 440-450 MHz.)
- **Programmable scan**
  Channel scan or band scan, search for open or busy channels.
- **SLIDE-LOC battery case**
- **10 Channels**
  10 memories, one for non-standard repeater offsets.
- **2.5 watts high power, 350 mW low**
  TR-3600A has 1.5 watts high or 300 mW low.

The Kenwood TR-2600A and the TR-3600A pack "big rig" features into the palm of your hand. It's really a "handy handful"!

Optional accessories:

- TU-35B built in programmable sub-tone encoder
- VB-2530 2-m 25 W RF power amp.
- ST-2 base stand/charger
- MS-1 mobile stand/charger
- PB-26 Ni-Cd battery
- DC-26 DC-DC converter
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/alkaline battery case
- RA-3 2-m telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- AX-2 shoulder strap w/ant. base
- CD-10 call sign display
- BH-2A belt hook

More TR-2600A and TR-3600A information is available from authorized Kenwood dealers.

CALL
TX/BUSY
KENWOOD
144 MHz FM TRANSCEIVER
KEY LOCK
REV
PROG S
MS
ALERT
TX OFFSET
MEMORY ADDRESS
PRIO. CH/−
M
+
S.STOP
S
BS/OS
TO/CO
M
PS(M8~9)
ALERT
TR-2600A

TR-2600A shown. TR-3600A is available for 70 cm operation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

KENWOOD

...pacesetter in Amateur radio

NEW
Compact 45 W 2 m

45 Affordable Watts!

TM-201B/401B

Super-compact mobile transceivers

The TM-201B boasts a powerful 45 watts output, easy-to-operate front panel controls, and ultra-compact size. The GaAsFET receiver front end provides high sensitivity and wide dynamic range. Receive and transmit characteristics are tailored for minimum distortion and excellent audio quality. Both the TM-201B and the TM-401B are supplied with a high-quality external speaker, 16-key DTMF microphone and mounting bracket.

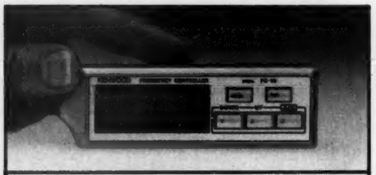
- 45 watt output, with HI/LO power switch (TM-401B has 25 watts output.) 5 W low.
- Dual digital VFOs
  TM-201B covers 142-149 MHz, includes certain MARS and CAP frequencies
  TM-401B covers 440-450 MHz
- 5 memories plus "COM" channel, with lithium battery back-up

5
10
15
10
20
20
40
WATTS
THRULINE®
BIRD ELECTRONIC CO

- Programmable, multi-function scanning
- High quality external speaker supplied
- Audible beeper confirms operation

Optional accessories:

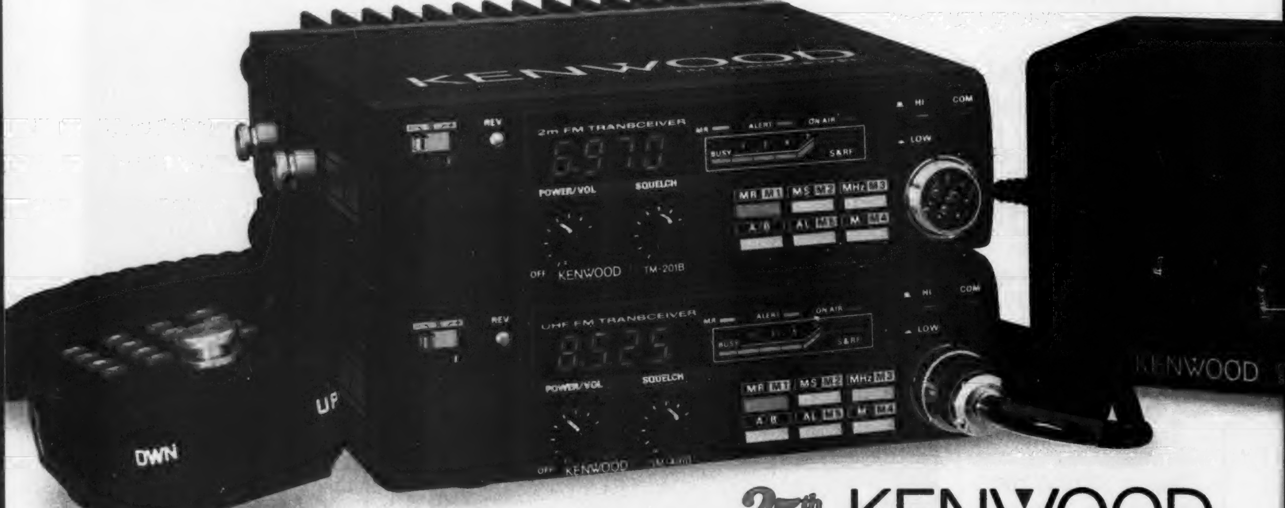
- PS-430 power supply
- TU-3 or TU-3A two frequency tone encoder
- FC-10 frequency controller
- MC-55 (8-pin) mobile microphone
- SP-40 compact mobile speaker
- SP-50 deluxe mobile speaker
- SW-100A/B SWR/power meters
- SW-200A/B SWR/power meters
- SWT-1 2 m antenna tuner
- SWT-2 70 cm antenna tuner
- PG-2K extra DC cable
- PG-3A DC line noise filter
- MB-201 extra mobile bracket



Optional FC-10 frequency controller

Convenient control keys for frequency UP/DOWN, MHz shift, VFO A/B, and MR (memory recall or change memory channel).

More information on the TM-201B/401B is available from authorized dealers.


KENWOOD
REV
2m FM TRANSCEIVER
UHF FM TRANSCEIVER
MR
ALERT
ON AIR
BUSY
S&RF
HI
LOW
COM
POWER/VOL
SQUELCH
MR M1
MS M2
MHz M3
A/B
AL M5
M M4
OFF
KENWOOD
TM-201B
UP
DWN
KENWOOD

KENWOOD

TM-401B is similar to the TM-201B, but covers 440-450 MHz and is 25 watts.
Specifications and prices subject to change without notice or obligation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

QRX . . .

EDITED BY PERRY DONHAM KW1O

Repeater Rules

THE FCC has taken positive action in the matter of repeater frequency coordination. In a final ruling on PR Docket 85-22, the Commission recognized the need for frequency coordination and included a definition of a frequency coordinator in Part 97. In cases of cochannel interference, the new rule stipulates that a non-coordinated repeater has the primary responsibility for resolving the problem. The rule does *not* make coordination mandatory, so repeater owners in less populous areas can continue to operate without a coordination council. Also note that owners of coordinated repeaters are not absolved of blame in interference cases . . . the rule is not intended to be used as a tool to force machines off the air. WA6ITF has the complete rundown in Looking West this month, beginning on page 87.

Canadian Setback

JACK RAVENSCROFT VE3SR has lost his case. Jack was sued by Tim and Dale Houghtby, who claimed that Jack's transmissions interfered with their electronic organ, their microwave oven, their furnace, and just about everything else electronic in the Houghtby house. The Canadian DOC examined the ham station and pronounced it clean. The judge, however, found that Ravenscroft's transmissions were a nuisance and issued an injunction forbidding Jack from transmitting from his house in any way that would interfere with electronic equipment owned by the Houghtbys. In addition, Jack was ordered to pay an award of just over $2,500 plus court costs. The decision sets a terrible precedent. WA6ITF, writing in the *Westlink Report*, says that some Canadian amateurs intend to force the government to step in and reverse the ruling by bringing a massive suit against a major Canadian broadcast company, claiming it to be a public nuisance.

Dayton Dossier

THE DAYTON HAMVENTION was incredible! This year's crowd was the largest ever, with 28,000 glassy-eyed hams tearing around deep in the throes of a spending frenzy. Most conspicuous were the dozen or so dealers selling IBM PC clones, all of them of course "99% compatible," whatever that means! Every day at Dayton held a special surprise. On Friday, some idiot tossed a stink bomb between the ICOM and the Kenwood booths in the main arena. On Saturday, an extension cord overheated and smoke filled the large ballroom; and the place was evacuated for about 30 minutes while the fire rescue team checked things out. (I'd like to congratulate the Hamvention security team on a very professional evacuation.) On Sunday, the main arena was plunged into darkness for nearly four hours when a pole pig roasted itself. Predictably, the darkness did not deter anyone from browsing, and it was nearly business as usual with the aid of flashlights (a booth in the arena was selling them for a dollar). Luckily, the lights came back on before the giant prize drawing on Sunday afternoon. Business was brisk all three days, and the weather was absolutely perfect over the entire weekend.

Lots O' Islands

BILL GOSNEY KE7C of the Whidbey Island DX Club (Bill also runs the *73* Awards Program and coordinates our SSB championships) sent in the latest list of countries for the **Island DX Award**. To qualify for the certificate, you must confirm at least 50 of the islands on the list. There are endorsements for SSB, CW, RTTY, SSTV, OSCAR, and so on. The list is pretty long; if you would like a copy, drop Bill an SASE care of the Whidbey Island DX Club, 2665 North Busby Road, Oak Harbor WA 98277.

Cliff Hanger

CLIFF WELLS KA7TVC decided to put an AEA Isopole up on his building in Kirkland, Washington. He asked the building's owner, who said it would be OK. Cliff put up the vertical so that it extended a few feet above the roof. Then a neighbor told him that the antenna was in violation of a city ordinance that regulates outside transmitting antennas, and that it would have to come down. Cliff asked about the ordinance at city hall, and was served a citation for breaking a three-year-old Kirkland law that requires a public hearing and a $350 fee whenever a transmitting antenna is put up. The best part: The law regulates *transmitting* antennas—if the Isopole were to be used only for receiving, it would be perfectly legal. Cliff has appealed the citation, and hopes that the law will be modified in light of the FCC's recent ruling on PRB-1.

Santec Save

CLIFF RODGERS of Beaumont, California, extricated himself from a tricky situation recently with the help of his trusty Santec HT. While spending the night in a motel "known for its low rates and cold pools," Cliff and his wife were disturbed by a loud pounding on the door. The view through the peephole was not promising, and Cliff decided to telephone the motel's security desk; unfortunately, the low rates included no phones. Thinking quickly (the pounding was getting louder), Cliff reached for his trusty HT and, with the help of a few local hams, got a message through to the motel's security man. The story has a happy ending, and Cliff notes, "Now when I go to faraway places with strange-sounding names, I always check to be sure my trusty HT is charged and packed!"

Firefighters rushed to the Dayton Hamvention after a smoking extension cord forced evacuation of the Wampler Ballarena.

Hambassador

ADVANCED ELECTRONIC APPLICATIONS, INC., has announced a new award designed to encourage hams who promote amateur radio to those outside of the hobby. The **Ham Ambassador Award** will be presented to the amateur who, in the opinion of the judges, has contributed most to introducing the public to amateur radio. A $1,000 prize will be presented to the winner, who will also receive round-trip airfare, meals, and hotel accommodations to the ARRL National Convention in San Diego on September 6, 1986. Any ham may nominate any other ham for the honor; the nomination must be made on a special AEA Amateur Ambassador Award nomination form, available by sending an SASE to AEA, PO Box C-2160, Lynnwood WA 98036. Nominations close August 15, 1986.

Top Ham

ROY NEAL K6DUE has been named **Ham of the Year** by the Dayton Amateur Radio Association (DARA). The award, presented at the Saturday night Hamvention Banquet, cited Roy for his outstanding contributions to the hobby, including his many promotional films ("Moving Up to Amateur Radio," "The World of Amateur Radio," and videos featuring the ham-in-space program) and his active role in convincing NASA that sending a ham transceiver into orbit with the space shuttle was "OK." Poor Roy had to give two speeches that night, as he was also the keynote speaker at the banquet. Saturday evening saw the presentation of two other honors: the **Special Achievement Award** to **Fr. Michael Mullen WA2GQW**, and the **Technical Achievement Award** to **Doug DeMaw W1FB.** Fr. Mullen is president of the International Mission Radio Association, an organization that equips hams involved in missionary work with amateur radio equipment. Doug DeMaw is world-famous for his easy-to-understand technical articles in *QST*, and served as the magazine's Senior Technical Editor until his retirement in 1983.

SARC Certificate

A SPECIAL AWARD IS AVAILABLE from the **Scarborough (Canada) Amateur Radio Club** to commemorate its 40th anniversary. To qualify, you must accumulate points by contacting VE hams: 20 points from VE3 and 20 points from other parts of Canada. For Canadians, every QSO counts one point. Contacts with stations using a special-event prefix or with members of SARC are worth five points. Ten points are awarded for a QSO with SARC club station VE3WE. For U.S. and DX operators, all of the points and bonuses are doubled. To claim your award, send a copy of your log, signed by two other amateurs, and one dollar or three IRCs to SARC, Box 174, Station D, Scarborough, Ontario, Canada M1R 5B5.

Bud Hill K1PD, Elmer to over 800 code students, receives a plaque of appreciation from Chelmsford ARC President Jim Fisk.

Extra Pool

THE NEW POOL of questions for the Extra-class examination has been released by the FCC. The pool of 456 questions must be used by volunteer examiners starting October 1, 1986, although VECs can start using them at any time. New questions have been added which deal with the volunteer examination program, including reimbursement, preparation of tests, and VE accreditation. Other questions have been modified slightly for clarification.

Packet Mania

NEXT MONTH is special! If you are interested in packet radio, don't miss the August issue of *73*...an entire issue devoted to packet! You'll find out how to set up your own station, discover the nuts and bolts of networking, and explore the esoteric side of the medium with the top names in the field. You won't want to miss this one—better check your expiration date!

SWL Pubs

TWO NEW PUBLICATIONS of interest to shortwave listeners are available from West Germany. The first, Dr. Jurgen Trochimczyk's Radio Beacon Handbook, lists more than 8,500 long- and medium-wave beacons from around the world. Stations are organized by callsign. The second book, Bern Friedwald's International Listening Guide, presents shortwave broadcasts in English, arranged by transmission time, and details their target areas and frequencies. Also included is a list of broadcasters' addresses. For information about the *Beacon Handbook,* contact Wilhelm Herbst Verlag, Postfach 45-05-06, D-5000 Koln 41, West Germany; if you're interested in the *International Listening Guide,* get in touch with DX Listeners' Service, Merianstr. 2, D-3588 Homberg, West Germany.

Code King

BUD HILL K1PD was honored recently by the Chelmsford (Mass.) Amateur Radio Club for 20 years of teaching Morse code. Bud has taught nearly 800 people the code, including 100 participants in the club's Police Amateur Radio Team (PART), an organization which meshes ham radio with law enforcement. When Bud first tried to learn Morse, his studies were impeded: "I couldn't practice code when my daughter's dog was in the house—he barked all the time." When asked how he solved the problem, Bud smiled and said, "They don't live here anymore."

New News

WHAT'S NEW THIS MONTH in *73*? A new feature, **Ham Awards, by Bill Smith N6MQS,** appears on page 107. Bill has been busy designing worksheets for the major on-the-air awards; every month we'll print a worksheet and a set of rules back-to-back so that you can cut the page out of the magazine and put it into a folder. On page 80 you'll find an order form for the all-new 73 **QSL Cards!** We've had so many requests for our high-quality, low-price QSLs that we've brought them back.

Important!

AS REPORTED LAST MONTH in QRX, the FCC has proposed enhancement of the Novice-class license to include data and voice operation on three bands. The NPRM, PR Docket 86-161, calls for data privileges from 28.1 to 28.3 MHz, SSB from 28.3 to 28.5 MHz, all amateur privileges from 220 to 225 MHz, and simplex and repeater privileges from 1246 to 1260 MHz. There are power restrictions on each band: 200 Watts PEP on 10 meters, 25 Watts on 1-1/4 meters, and 5 Watts on 23 centimeters. The new rule would allow higher-class stations to run their legal limit in these Novice subbands. Novices would be allowed to operate through a repeater, but would not be allowed to be the trustee of one. Initial comments are due at the FCC by July 16th, and reply comments must be received in Washington by August 20th. To file comments, send an original and five copies (11 copies if you want each Commissioner to have one) to the FCC, 1919 M Street NW, Washington DC 20554. Include the docket number in the head of your comments (see page 89 for an example page). The Commission is especially interested in hearing what you think about reducing the term of the Novice license to encourage upgrading, and whether the General-class exam should be broken into two parts, one covering VHF and one covering HF, to help Novices upgrade to Technician.

QRV

THIS EDITION of QRX comes to you with the aid of *The W5YI Report, Westlink, Sweden Calling DXers, Splatter,* and Claire Azzalina. Send your photos and stories to *73* Magazine, WGE Center, Peterborough NH 03458.

Uncle Ben says...

"I give you much more than just the lowest price...

"Uncle Ben" Snyder, W2SOH the head man of

HARRISON

"HAM HEADQUARTERS, USA®" *...Since 1925!*

When you get that exciting new piece of equipment *from me*, you know you are going to be completely happy... I see to it, personally! I also give you earliest delivery, greatest trade-in allowances, my friendly assistance in every possible way.

Just ask any of the many thousands of hams all over the world who have been enjoying my friendly good service for over a half a century. *73, Uncle Ben, W2SOH*

- ***CALL ME...*** (516) 293-7995
- ***WRITE ME...*** For my prompt, personal reply.
- ***SEE ME...*** At one of the world's largest Ham Supply Centers!

HARRISON

HAS THEM ALL!

KENWOOD

NEW!

Kenwood TH21AT, 31AT, 41AT

Kenwood TM-2570A

Kenwood TS-940S

Kenwood TS-430S

Kenwood TR-2600, TR-3600

Kenwood TS-711A (2m)
TS-811A (70 cm)

✓94

master charge
VISA
CHARGE IT!

HARRISON RADIO
Since 1925!

"HAM HEADQUARTERS, USA®"
2263 Route 110 (at Smith St.)
E. Farmingdale, NY 11735
1-(516) 293-7995

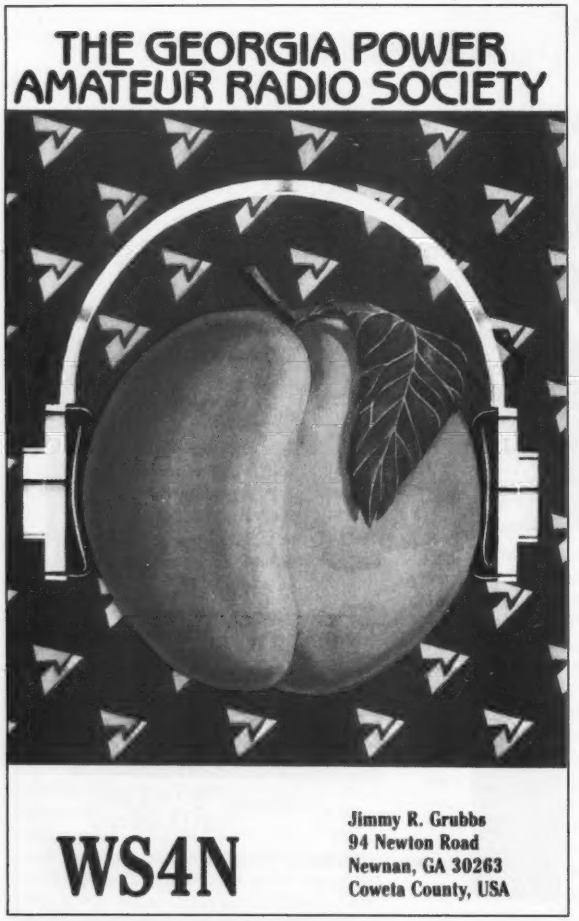
NEVER SAY DIE

from page 4

and are ready to face lung cancer, heart attacks, and emphysema, well you'd better get busy getting more hams so we'll have someone to replace you—and soon. I can see the 2020 Hamvention with one ham creeping slowly into a hotel room in the Dayton Biltmore, moving his walker up to the card table exhibit of Japanese gear being sold by the sole remaining ham dealer. . .and asking for a discount.

A ham friend of mine has some houses he rents out to students at a nearby college. He keeps an eye on 'em and has been apalled to see that a high percentage of them are alcoholics. Many of them put away one or two six packs of beer a night. There's nothing like peer pressure to overcome common sense. I don't know how I managed to avoid getting messed up when I was in college. My fraternity brothers made a big deal out of drinking beer. Oh, I tried it, but it tasted awful, so I never learned to like it. I tried smoking, too—didn't like that either. I guess peer pressure didn't work well with me. I was never much of a follower—preferring, from an early age, to be a leader.

Look here, I know how difficult it is to diet. I'm a known fooder. I've been dieting since I got fat when I was about seven years old. I did thin down a bit while I was in the Navy—had to in order to look good in my tailor-made uniforms. In 1972 I got tired of being fat and went on a long, slow diet, taking off 85 pounds. And, unlike most dieters, I've managed to keep most of it off ever since.



THE GEORGIA POWER
AMATEUR RADIO SOCIETY

WS4N

Jimmy R. Grubbs
94 Newton Road
Newnan, GA 30263
Coweta County, USA

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

I know all about fasting and dieting. My body is ready to fight back at the slightest sign of a food cutback. If I skip lunch, by two in the afternoon my body is in a panic—Oh God, he's fasting! It quickly gives me a big headache, makes me sweat, get dizzy, and feel as if I haven't eaten for a week.

Dieting isn't difficult, once I make up my mind to it. My body doesn't fight dieting like it fights fasting. I can lose a third of a pound day after day for months with no serious physical effects. Of course it does take a lot of resolve to pass up ice cream, desserts, and such nonsense.

A serious dieter has an accurate doctor's scale and weighs in meticulously every morning, ticking off the third-pound losses. A serious dieter wants that scale to go down so badly he brushes his teeth before weighing in to get rid of that heavy plaque, shaves to cut off that heavy stubble—and maybe spits a couple times for good measure. It's a good idea to check for ear wax, too.

Next year at Dayton I want to see a bunch of younger-looking old-timers, without those gross, disgusting beer bellies and hacking coughs, going by my *73* booth. We used to believe that youngsters were the future of amateur radio; now we know the odds are good that the future is us old-timers.

Look here, if anyone as weak-willed as I can diet and take off 85 pounds at one whack. . .and keep it off for 14 years. . .there's no good reason why you can't do it too. The next thing you know you'll be trimming down and joining me out there putting in a couple miles of brisk walking every morning. No, I'm not pushing for you to become a fitness fanatic—I just want you to be around to renew your subscription to *73* for a few more years and say hello to me at Dayton, Miami, Orlando, Dallas, Atlanta and so on.

A recent large-scale study on alcohol showed that even light drinkers substantially worsen their odds for living long lives. As I recall the radio CBS report, one drink a day cuts your chances of living to 72 in half. A couple drinks a day cuts it to one third. Now, how about a nice cold 807?

Thank heavens the studies show that sex contributes to longer life! It's a darned good substitute for liquor and cigarettes. . .unless your wife catches you.

Ham Industry Meeting

About a hundred ham industry people gathered at Dayton the evening before the Hamvention. Maybe 40 firms were represented—a pretty poor showing. The main concern for those concerned enough to come to the meeting was the increasing drop in new hams—down 8.5% over the previous year, with no turnaround in sight.

A year ago at Miami some industry people met and came up with an idea for a ham comic book as a way to interest youngsters in the hobby. That was while I was divorced from *73*, so I missed the meeting. This project is moving along slowly.

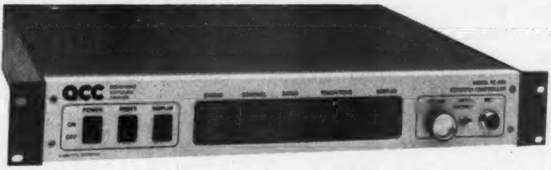
I explained the approach I feel is needed if we're going to get amateur radio really growing again. This means getting youngsters coming in again. In order to do that we need to rebuild the school radio club infrastructure which brought us hams until the clubs folded around twenty years ago—victims of the Incentive Licensing disaster.

I explained that we need to get what we have left in ham clubs to sponsor school radio clubs in their areas—Elmering them. No, it won't be easy. Schools will fight any changes, as they always have. They'll put up all sorts of obstacles to anything which means more work for them, even slightly more work. But if we work together, sharing our successes, we can do it.

Without a rebuilt radio club infrastructure, I don't believe comic books or TV shows about amateur radio will get us much. Look at how successful peer pressure is in getting kids to go for cigarettes, beer, pot, and coke! It used to be as effective selling amateur radio—with benefits to everyone. Most kids got started on lifetime high-tech careers—our country had the engineers, technicians, and scientists which put us number one in the world in technology.

It's up to us whether we'll be bringing over more and more Japanese technicians to repair our radios. Remember, we're

When we set out to make the best amateur radio equipment in the world, we had some pretty tough standards to live up to ...



... yours

... and ours.

So we designed the **RC-850 Repeater Controller**, the industry's top of the line repeater control system. Now in it's "third wave" of innovation, thanks to its designed for the future architecture and new software releases. The '850 defines the industry standard in repeater control systems.

- Fully remotely programmable with Touch-Tone commands
- Front panel LED display
- Over 300 word customized male and female speech synthesis vocabulary
- Time/day of week Scheduler with 10 set-up states, 30 changeovers and events, over 100 scheduled items for hands off operation and automatic reminders.
- Full or half duplex autopatch, autodial (250 numbers), emergency autodial, reverse autopatch, antidialer, toll restrict including telephone exchange tables, supports remote and multiple phone lines
- Informative remotely programmable ID's (17), tail messages (13), bulletin boards (5)
- 16 channel voice response analog metering, automatic storage of min/max values on each channel, values may be read back on command or may be included in any programmable messages
- Supports synthesized remote base transceivers and full duplex links
- Individual user access codes to selectable features
- Mailbox for user-to-user, and system-to-user messages
- Paging – two-tone, 5/6 tone, DTMF, CTCSS, HSC display, user commandable and may be included in programmable messages (i.e. alarms)
- Easy hookup to any repeater

If your repeater budget can't afford the '850, we offer the **RC-85 Repeater Controller**, which we like to call the "second best repeater controller in the world". It's a scaled down, simplified version of our '850, but overall, it offers more capability and higher quality than anyone elses control equipment at any price.

- Remotely programmable with Touch-Tone commands
- Over 175 word customized male speech synthesis vocabulary
- Selectable "Macro sets" for easy control operator selection
- Autopatch, autodial (200) numbers, emergency autodial, reverse patch
- Remotely programmable informative ID's (7), tail messages (3), bulletin board (2)
- Supports synthesized remote base transceiver, control receiver, alarm
- Selectable, informative courtesy tones
- Talking S-meter, Two-tone paging
- Easy hookup to any repeater

For those who like to "roll their own", we can get you off to a rolling start with our **ITC-32 Intelligent Touch-Tone Control Board**. Much more than just a decoder, it's a mini-control system of its own, with the basic repeater and remote base functions built-in. And it can be tailored by you with its Personality Prom.

- 28 remotely controllable latched or pulsed logic outputs
- 4 alarm or remote sensed logic inputs
- Response messages to confirm command entry
- Repeater functions including COR, IDer, timers, courtesy tone, etc.
- Remote base functions including control of synthesized transceiver

Our new **Digital Voice Recorder** lets you remotely record ID's, tail messages, and various other response messages for automatic playback through your repeater. Audio is stored digitally with no-compromise reproduction quality in up to eight megabits of memory. The DVR can support up to three independent repeaters for a low per-channel cost. Its Touch-Tone activated voice mailbox lets your users easily record messages for other users when they aren't around.

- Remotely recordable, variable length audio tracks, accessed from controller messages
- Top quality, no compromise audio reproduction
- Supports up to three repeaters for cost effective installation
- Expandable to roughly 6 minutes of speech in 8 megabits of memory
- Easy interface to RC-850, RC-85 controllers, or to any stand-alone repeater

QST: Attention All Hams

If you own a shack, you should know about ShackMaster™.

ShackMaster lets you carry your home station with you in the palm of your hand. It acts as your gateway to the world, linking your handheld transceiver to your high performance HF station. Now, instead of your valuable home equipment being available to you 1% of the time, it's available 99% of the time! Whether around the house, in the yard, or across town, ShackMaster let's you take it with you.

But that's just part of ShackMaster's story. It lets you communicate with the family by handling third party traffic – its electronic mailbox and intercom let you keep in touch. And a simplex patch lets you place important calls directly through your home phone.

- Crossband linking – VHF/UHF to HF
- Telephone access to your home station
- BSR Home Control interface
- Electronic Mailbox
- ShackPatch™ intercom into the shack
- PersonalPatch™ simplex autopatch

All our products are documented with high quality, easy to read manuals. Our goal is to advance the state of the repeater art. But most of all, our products put the FUN back into the FUN MODE!

To order one of these advanced control products, call 408-749-8330. Technical manuals are available for purchase and the amount paid is applied as a deposit on the equipment. For specifications and a copy of our ACC Notes newsletter, just write or send in your QSL card to:

VISA MasterCard

Visa and Mastercard accepted.

acc advanced computer controls, inc.

10816 Northridge Square • Cupertino, CA 95014 **(408) 727-3330** heading into a communications age beyond anything you've imagined. We're going to see communications expand by a factor of a thousand to a million over the next few years. This is going to require millions of engineers and technicians—are they going to be American or Japanese? The answer is up to you and your ham club.

The industry people listened politely and most agreed with my proposal. But of course the old code-free license matter came up. Maybe, if we can get a code-free license, we can get youngsters into amateur radio. Maybe, but without the school radio clubs, I doubt it.

Only one person held out for maintaining the Morse-code test, with the others all in favor of some sort of no-code test. The holdout's credibility was somewhat weakened when it was noted that his firm's main business is selling code courses. It seemed like a triumph of self-interest over reason.

The next obvious question was, well, if just about every industry person wants a no-code license, how can we get one? The FCC's Johnny Johnston was there, so they asked him what might do it. Johnny made it clear—the FCC went to a lot of time and expense to try to get a no-code license. The ARRL killed it, put it in its coffin, and drove a stake through its heart. The only way you're going to get the Commission to reconsider no-code is by getting the ARRL to pull the stake back out of its heart.

Hmmm. How can we do that, they asked? Lew McCoy, who spent much of his life working at ARRL HQ before he retired a few years ago, got up and explained the facts of life. If you want the ARRL to favor no-code, it's very simple. You have three other ham magazines for your advertising—*CQ, 73,* and *HR*. If you move your ads from *QST* to the other magazines you'll have the ARRL Board down picketing the FCC for a no-code license.

Everyone agreed Lew was right. It was too self-serving for anyone from the three magazines to do more than join the cheers. No one from the ARRL bothered to come to the ham industry meeting, so there was no comment from them.

I will frankly be surprised if any advertisers have the guts to try and put pressure on the ARRL. I watched every major manufacturer go bankrupt or change to some other business twenty years ago, advertising first in *QST* right to the bitter end. You can look back in your old copies of *QST* at the ads by Hallicrafters, Hammarlund, Johnson, Barker & Williamson, Webster, Sideband Engineers, Gonset, Central Electronics, Harvey Wells, Multi-Elmac, World Radio, Lakeshore Industries, Eldico, Sonar, RME, Millen, National Radio, Thordarson, United Transformer, and so on.

It'll be interesting to see what happens. My bet is that nothing will. Safe bet, at least for quite a while. Until we have school radio clubs in place to help youngsters get licensed, it seems irrelevant to me. Once we have 'em, you'll see me pushing to replace the outmoded code exam with a tougher technical exam—getting away from forcing kids to learn an unneeded skill in this packet world and into really getting started toward technical understanding, which will stand them in good stead the rest of their lives.

It would be nice if the ham industry people became more involved with the health of their industry. They certainly have everything to gain from a fast-growing hobby as compared to the dying one we have now.

Will I be seeing you at Dayton next year? Will I be seeing a new, thinner you? A you which doesn't stink of cigarette smoke? It's the big show of the year, so see what you can do.

A NICE THICK MAGAZINE

One thing that gets mentioned frequently is how much you prefer a nice thick magazine to a little bitty skinny one. Me too, even though it's a lot more work. With some cooperation from you, we'll have *73* so thick you won't be finished with it by the time the next issue arrives—you know, like it was a few years ago.

The formula for a thick magazine is simple—the more ads we have, the more pages of articles we can run. While I don't have to make any money with *73*, I also am not dumb enough to plan to lose a lot of money with it. How do we get more advertising? That's simple too—one way is by getting more readers so ads in *73* will sell more products. Another is to let advertisers know when their ad in *73* got the sale for them.

I'll appreciate any help you can give on getting subscribers. Maybe you can do something with your club—I've got some special bonuses for clubs. Perhaps your club is going to have a hamfest or auction and could run a *73* table. Or maybe you have an idea I haven't thought of yet. You know, less than half the hams read *any* ham magazine. Maybe you can find out why they don't—or even better, how I can get them to break this disgusting habit. Check around and let me know. . . okay?

If advertisers think one of the other ham magazines is going to sell more gear for them, they'll spend their ad dollars there and I'll have fewer pages for you. If you're into heavy-duty construction projects, patronize *HR* advertisers. If you're into contests, hit on the *CQ* advertisers. If you want a bigger, fatter *73*—and no, I won't write more pages of editorials than I'm doing now, so don't gripe about that—with more simple construction projects, more reports on OSCAR, packet, and other fun activities—run your fingers, do not walk them, to the Reader Service card. Next, pick out the advertisements which almost have you ready to write a check or make an 800 call to order—mark the card and get it to me.

Buying new gear is one of the most exciting parts of hamming. It's exciting to open the box, get the gear set up, and make that first contact! Two demerits if you have to use the instruction book. Tsk. I'd as soon consult an instruction book as ask directions when I'm lost. No way!

Unless you're really into reincarnation, you've got to plan to only live once. You aren't going to waste a whole lifetime sitting there braying on 75m are you? Or waiting forever for someone to discover your repeater by accident? Or do you have two repeaters? With 9,759 active two-meter ops and 10,627 repeaters, a few of you have more than one repeater. Amateur radio is a whole bunch of fascinating hobbies, so why get hung up on just one? Have you tried slow scan? 2m Aurora? 80m DXing? 10 GHz? RTTY? I have and I loved every minute of it!

One of the great pleasures of publishing *73* is my responsibility to test out new ham gear. Boy, is that a tough job! Heh, heh. I just love prying the damned staples out of the boxes, then trying to shake the unit and its foam insert out of the box. There are all those plastic bags with cellophane tape which tears the bags when you try to open 'em. Each cable, connector, fuse, and other accessory is always bagged and taped. But when I get it all set up and turn it on—ahhh, nirvana.

It doesn't matter if it's a two-meter mobile rig, a 220 HT, a new slow-scan monitor, or a new keyer—it's exciting and I can hardly wait to see how it works and tell anyone all about it who blunders onto my frequency.

If you see an ad in another magazine which you just can't pass up, the least you can do is drive the manufacturer or dealer crazy by telling 'em you saw their ad in *73*. Chuckle.

You know, if we can get school radio clubs back in business, I think we'll start seeing new young hams by the zillions—and we both know they're going to be reading *73*, where the action is. Can *73* ever get to be the size of *Byte* and *80-Micro?* Sure it can! And hamming will be one of the best known hobbies in the country—a hobby you can really be proud of. You know, both *Byte* and *80-Micro* got up to 600 pages a month—how'd you like to face that? They used to give postmen hernias.

I had a postcard the other day from a very confused reader who somehow had managed to convince himself that I took on *73* in order to make money. Great fantasy. As far as I recall, I never made much, if any, money with *73*. How do you run a business losing money every year? Mostly by being smart enough not to lose enough so you go out of business. It's called the Ponzi Scheme after a chap in the 20s who made millions with the idea.

When CW took over *73* they looked at it and decided running a magazine for fun was crazy, so they set it up to make money and damned near killed it. No one makes money with ham magazines except the ARRL. Computer magazines make millions. Audio magazines make millions. Ham magazines, at best, break even. That's my experience. Of course if we manage to develop 1% of the population into hams—about 2.5 million—and the *73* readership goes up to maybe 500,000—then I might not be able to prevent myself from making money. No, I'm selling myself short. . . I'd manage. Let's get those 2.5 million hams and I'll prove it.

In the meanwhile please get your Reader Service card to me—and none of that marking every number, either. If I think you're fudging it just to try and cozy up to

Continued on page 74

Food for thought.

Our new Universal Tone Encoder lends its versatility to all tastes. The menu includes all CTCSS, as well as Burst Tones, Touch Tones, and Test Tones. No counter or test equipment required to set frequency-just dial it in. While traveling, use it on your Amateur transceiver to access tone operated systems, or in your service van to check out your customers' repeaters; also, as a piece of test equipment to modulate your Service Monitor or signal generator. It can even operate off an internal nine volt battery, and is available for one day delivery, backed by our one year warranty.

- All tones in Group A and Group B are included.
- Output level flat to within 1.5db over entire range selected.
- Separate level adjust pots and output connections for each tone Group.
- Immune to RF
- Powered by 6-30vdc, unregulated at 8 ma.
- Low impedance, low distortion, adjustable sinewave output, 5v peak-to-peak
- Instant start-up.
- Off position for no tone output.
- Reverse polarity protection built-in.

Group A

67.0 XZ	91.5 ZZ	118.8 2B	156.7 5A
71.9 XA	94.8 ZA	123.0 3Z	162.2 5B
74.4 WA	97.4 ZB	127.3 3A	167.9 6Z
77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
82.5 YZ	107.2 1B	141.3 4A	186.2 7Z
85.4 YA	110.9 2Z	146.2 4B	192.8 7A
88.5 YB	114.8 2A	151.4 5Z	203.5 M1

- Frequency accuracy, ± .1 Hz maximum - 40°C to + 85°C
- Frequencies to 250 Hz available on special order
- Continuous tone

Group B

TEST-TONES:	TOUCH-TONES:		BURST TONES:			
600	697	1209	1600	1850	2150	2400
1000	770	1336	1650	1900	2200	2450
1500	852	1477	1700	1950	2250	2500
2175	941	1633	1750	2000	2300	2550
2805			1800	2100	2350	

- Frequency accuracy, ± 1 Hz maximum - 40°C to + 85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

Model TE-64 $79.95

10

COMMUNICATIONS SPECIALISTS

426 West Taft Avenue, Orange, California 92667
(800) 854-0547/ California: (714) 998-3021

MasterCard VISA

"The BEST is still made in U.S.A."

MIRAGE/KLM

Under New Ownership

American made RF Amplifiers and Watt/SWR Meters of exceptional value and performance.

•5 year warranty • prompt U.S. service and assistance

RF AMPLIFIERS

2 METERS-ALL MODE

B23 2W in = 30W out
(useable in: 100 mW-5W)

B108 10W in = 80W out
(1W = 15W, 2W = 30W) RX preamp

B1016 10W in = 160W out
(1W = 35W, 2W = 90W) RX preamp

B3016 30W in = 160W out
(useable in: 15-45W) RX preamp
(10W = 100W)

220 MHz ALL MODE

C106 10W in = 60W out
(1W=15W, 2W = 30W) RX preamp

C1012 10W in = 120W out
(2W = 45W, 5W = 90W) RX preamp

C22 2W in = 20W out
(useable in: 200mW-5W)

RC-1 AMPLIFIER REMOTE CONTROL

Duplicates all switches, 18' cable

WATT/SWR METERS

- peak or average reading
- direct SWR reading

MP-1 (HF) 1.8-30 MHz
MP-2 (VHF) 50-200 MHz

430-450 MHz ALL MODE

D24 2W in = 40W out
(1W = 25W)

D1010 10W in = 100W out
(1W = 25W, 2W = 50W)

Available at local dealers throughout the world.

✓91

MIRAGE/KLM
COMMUNICATIONS EQUIPMENT, INC.

16890 Church St., Morgan Hill, CA 95037, (408) 779-7363

Spectrum Repeater/Link

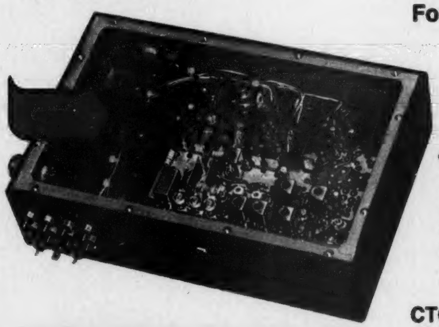
High Performance Boards & Sub-Assemblies

These are professional "Commercial Grade" Units—Designed for Extreme Environments (−30 to 60° C.) All Equipment Assembled & Tested.

For 10M, 2M, 220 MHz, & 440 MHz

New FL-4 UHF Helical Resonators

Installed in Receiver or FL-4H Preselector Unit



COMPLETE SHIELDED RCVR. ASSY.

VHF & UHF Receiver Boards

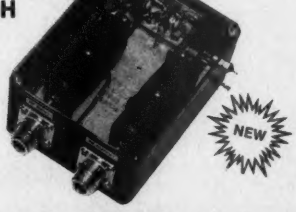
SCR200A-VHF SCR450A-UHF

- ***Totally Advanced Design!***
- 8 Pole Front End Fltr. + wide dynamic range—Reduces overload, Spurious Resp. & Intermod.
- Sens. 0.25 µV/12dB SINAD typ.
- Sel. -6dB @ ± 6.5 KHz. -130dB @ ±30KHz. (8 Pole Crystal + 4 Pole Ceramic Fltrs.
- 'S Meter', Discriminator & Deviation Mtr. Outputs!
- Exc. audio quality! Fast squelch! w/0.0005% Crystal. (*"Super Sharp" IF Fltr. also avail.*)
- ***New! 30 KHz B.W. IF Filter for High Speed Packet.***

Complete Receiver Assemblies

- Rcvr. Board mounted in shielded housing.
- Completely assembled & tested, w/F.T. caps, SO239 conn.
- As used in the SCR 1000/2000X. Ready to drop into your system!
- UHF Rcvr. Assy. Now Available w/Super Sharp FL-4 Helical Resonators. Greatly reduces IM & "out of band" interference!

FL—4H



Receiver Front-End Preselectors

- **FL-6: 6Hi Q Resonators with Lo-Noise Transistor Amp (2M or 220 MHz)**
- **FL-4H: 4Hi Q Helical Resonators & Lo-Noise Tr. Amp. in shielded housing. (420-470 MHz)**
- **Provides tremendous rejection of "out-of-band" signals w/out the usual loss!** Can often be used instead of large expensive cavity filters.
- Extremely helpful at sites with many nearby transmitters to "filter-out" these out-of-band signals.

Call or Write for Data Sheets

ID250A CW ID & Audio Mixer Board

- **Improved! Now includes "audio mute" circuit and "Emergency Power" ID option.**
- 4 input • AF Mixer & Local Mic. amp.
- PROM Memory—250 bits/channel.
- Up to 4 different ID channels!
- Many other features. Factory programmed.

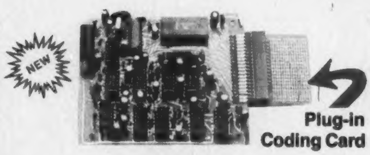
CTC100 Rptr. COR Timer/Control Bd.

- Complete solid state control for rptr. COR "Hang" Timer, "Time-Out" Timer, TX local & remote Shut-down/Reset, etc.
- Includes inputs & outputs for panel controls & lamps.

Repeater Tone & Control Bds.

For SCR1000/4000 & CTC100/ID250 only

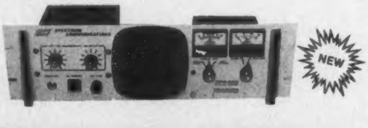
- TMR-1 "Kerchunker Killer" or "Time Out Warning Tone" Board
- TRA-1 "Courtesy Tone Beeper" Board



Plug-in Coding Card

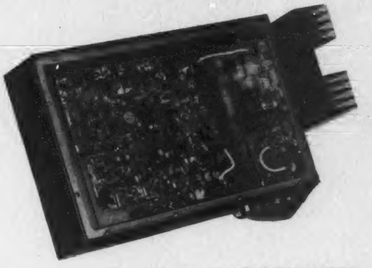
TTC300 TOUCH TONE CONTROLLER

- High performance, Super versatile design. To control any ON/OFF Function at a remote site via DTMF Radio Link.
- Uses new high quality Xtal Controlled Decoder IC, w/high immunity to falsing
- Decodes all 16 digits
- 3 ON/OFF Functions per Main Card. Easily expandable to any no. of functions w/Expansion Cards.
- Codes quickly field programmable via plug-in Coding Cards. Many unique 3-digit codes available. Not basically 1-digit as with competitive units.
- Latched or pulsed outputs.
- Transistor Switch outputs can directly trigger solid state circuitry or relays, etc. for any type of control function.
- Low Power Consumption CMOS Technology. 5VDC Input. Gold-plated connectors.



SCR 500 VHF/UHF COMMERCIAL LINK/CONTROL RECEIVER

- SCR200A or SCR450A rack mounted
- Available with or without meters and power supply



Improved SCT410B Transmitter Assy.

SCT110 VHF Xmtr/Exciter Board

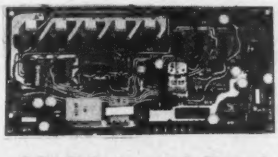
- **10 Wts. Output. 100% Duty Cycle!**
- Withstands High VS-WR
- True FM for exc. audio quality
- Designed specificially for continuous rptr. service. Very low in "white noise."
- Spurious– 75 dB. Harmonics–60 dB.
- With .0005% precision grade xtal.
- **BA-30 30 Wt. Amp board & Heat sink,** 3 sec. L.P filter & rel. pwr. sensor.
- **BA75 75 Wt. unit also available**

SCT110 Transmitter Assembly

- ***SCT110 mounted in shielded housing***
- Same as used on SCR 1000 & 2000X
- Completely assmbld. w/F.T. caps, SO239 conn.
- 10, 30, or 75 Wt. unit.

SCT 410B UHF Transmitter Bd. or Assy.

- Similar to SCT110, 10 Wts. nom.
- ***Now includes "on board" proportional Xtal Osc./Oven circuitry for very high stability!***
- **BA-40 40W. UHF AMP. BD. & HEAT SINK**



SCAP Autopatch Board

- Provides all basic autopatch functions
- Secure 3 Digit Access; 1 Aux On-Off function, Audio AGC; Built-in timers; etc. Beautiful Audio!
- 0/1 inhibit bd. also available
- Write/call for details and a data sheet

RPCM Board

- Used w/SCAP board to provide "Reverse Patch" and Land-Line Control of Repeater
- Includes land-line "answering" circuitry

Lightning Arrester For Autopatch

- Gas Discharge Tube shunts phone line surges to ground
- Handles up to 40,000 Amps!
- The Best device available to protect Autopatch equipment from lightning damage. $17.00 + S/H.

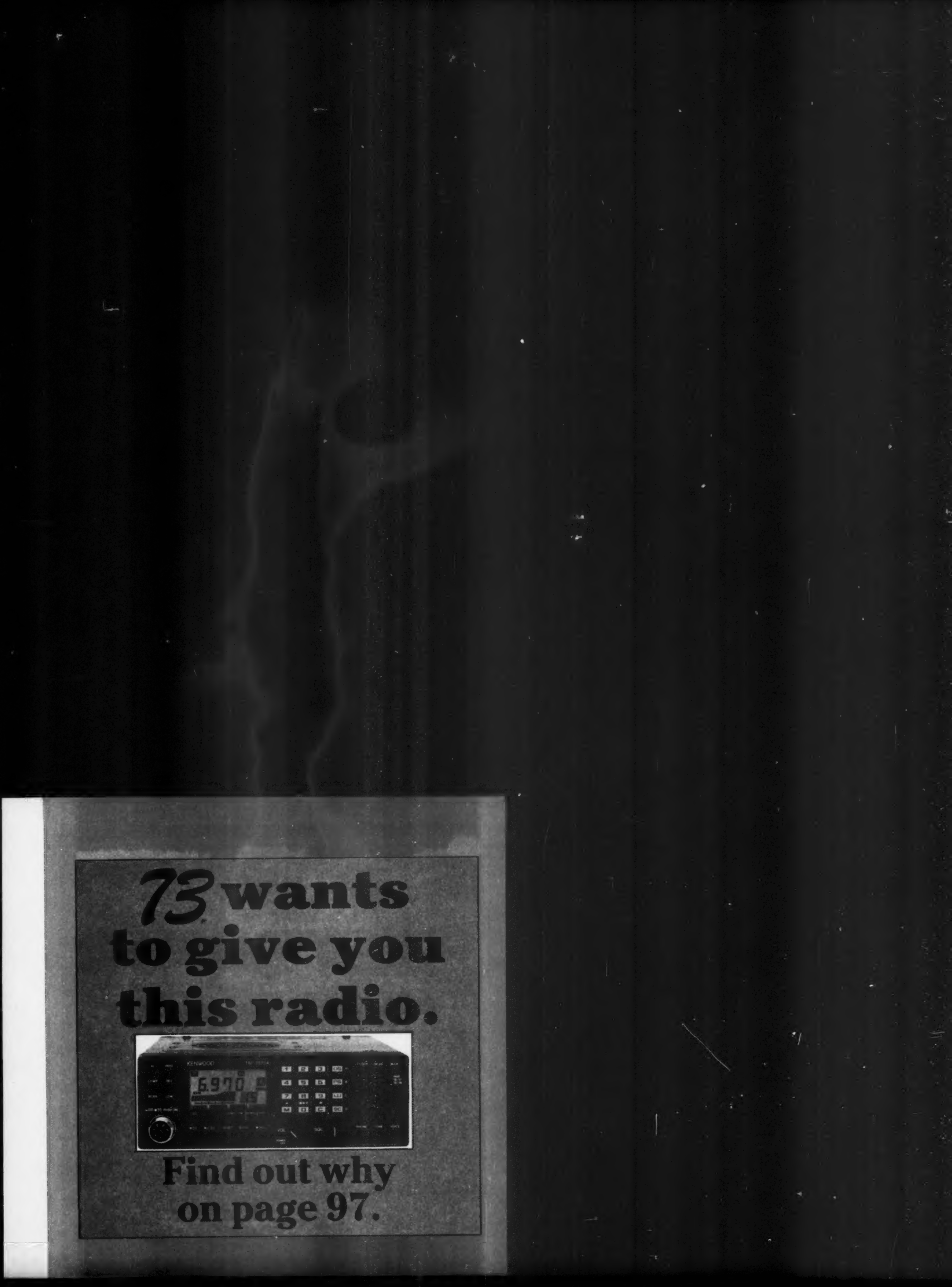
¡ se habla Espanol !

SPECTRUM COMMUNICATIONS CORP.

✓51

1055 W. Germantown Pk, S7 • Norristown, PA 190403 • (215) 631-1710 • TELEX: 846-211

DAYTON
1986
to Exhibits
PUB OPEN 400 AM
BREAKFAST
PRIZE DONORS
6 4 2 5 9 11 1 2 3 6
THIS IS NO MUSEUM THIS JUNK IS FOR SALE
EXIT


73 wants to give you this radio.
KENWOOD
Find out why on page 97.

73 wants to give you this radio.

KENWOOD
6.970

Find out why on page 97.

LETTERS

COLD CLUB

My wife, bless her heart, let me talk her into getting involved in my hobby. Since I don't have the patience to teach a family member anything, I figured a radio club would be a good introduction.

We chose the club at her place of work. I won't name names, but it is a very large electronics firm here and they have one of the oldest clubs in the state. When the meeting started, they had the usual reading of the minutes and such. Then the subject came up that the club needed an item for its repeater. The fellas that wanted the club to buy it were asked to give the reasons. After a short discussion with a lot of "humms" and "ahs," they admitted that they guessed they didn't need the item after all, especially since they didn't intend on putting the device in anyway. They figured someone else could do that. No one had the time to work with it, so they didn't buy it.

Then it was time to nominate a new president. Everyone looked at each other, waiting for someone else to talk. Either no one cared, or they felt they might have to be president if they opened their mouth. They never did nominate anyone that night. How sad!

Another year and these guys will be gone. In the hour and a half not a word was said to us, as if we were not there or not welcome. Not real inviting. They did, however, have a very nice talk about propagation. I learned a lot from that, but my wife was pretty bored.

There is another club in town that we're going to try. It is much more active, I'm told. I sure hope so! One club isn't a good sample, but from what I've been reading, this one was a good example. Truly sad.

Dave Kelley WA7GPF
Chandler AZ

HAM AM

I have to admit that I was angered by the statement in Perry Donham's April QRX column that "the whine of heterodynes" will be returning to our voice bands. My reaction was not because I favor the abolition of full-carrier DSB AM, but because the statement went on to become a gross distortion of the arguments raised by Don Chester K4KYV and other AMers who are protesting the 50% power reduction to be forced on them when FCC Docket 82-624 takes full effect in 1990. The segment seemed phrased to do little more than to try to inflame our SSB brethren and to try to dismiss AMers as a few reactionary old stick-in-the-muds.

Far from being dead, AM is returning with a vengeance, with scores of new stations coming on each year in different areas of the country. It's ironic that AM, the pioneer voice mode, is once again a "growth mode." This seems to point out to me that something fundamental is missing from today's amateur radio. The AM resurgence had been confined to the Northeast, but is now picking up in the South and the West and in other regions. Credit for this in many ways goes to the Society for the Promotion of Amplitude Modulation (SPAM) and to the *AM Press/Exchange* magazine.

There are many reasons for this return to AM activity. Number one is because the design of a DSB AM rig is very basic. It's the simplest voice rig to design and build. You can throw one together in a weekend if you cheat a little bit and use a stereo or PA amp for a modulator. Reason number two is that the equipment and parts are available for a song at hamfests. They are usually hidden underneath the tables and scorned by most hams as junk. Reason number three is that it is just plain old fun. The element of fun is what will attract newcomers to our hobby and sustain it into the future.

Right now I can see all the hi-tech computer and packet types chuckling among themselves. So what if most AM technology is not state-of-the-art; it can be and in commercial AM transmitters it is! AM is easy to understand, it is easy to fix, it teaches people something about radio theory, and it is fun. The emphasis of amateur radio does not always have to be on hi-tech. The use of AM should be seen as a logical step in educating oneself about electronics and achieving mastery over analog electronics. From there you can move onto digital electronics. I feel it is important to know from whence you came.

The continued use of AM is in no way a threat to our bands, or to anyone else trying to pursue his end of the hobby, be it SSB, RTTY, or whatever. This is because we do live in an age of hi-tech, and AM will remain a minority mode in use by only a few hundred or a few thousand newcomers or experimenters.

Use of high-power class-C plate-modulated amplifiers on AM has taught me more about radio than anything I could have picked up using a TS-820. Contrary to Perry's claim that there are very few class-C plate-modulated rf amplifiers in use, there are thousands in use the world over in communications and broadcasting. I have been able to take the knowledge I gained in amateur radio and apply it to my job. Those thousands of rigs will still be out there into the next century, and somebody is going to have to fix them.

I recently saw a small crowd of hams at a hamfest gathered around a table where there was a small object that no one could identify or explain. It was a vacuum capacitor! One fellow asked me how many Watts he could expect to get out of "that tube." I'll bet he got his radio education putting together Heathkits and now sends his ICOM back to the factory when it breaks. All I would like to see is an end to the blatant discrimination against AM, AM users, and AM groups by the FCC, the ARRL, the mass-circulation ham magazines, and by the SSB jammers. I'm not talking about bringing back spark; I just would like to see AM come out of the closet and have hams recognize that AM is still a part of modern communications.

I am continually fascinated by the progression of technology, the rise of solid-state, LSI, computers, packet, etc. However, I feel that AM still has a place in amateur radio for the beginner, the experimenter, or the hi-fi enthusiast. AM can be state-of-the-art, too. How about an all-solid-state hi-fi AM rig? There is now a 50-kW commercial AM rig available. I personally want to experiment with pulse-duration modulation. What about AM stereo or multichannel techniques, or synchronous detection for hi-fi reception? The potential for experimentation on AM has been too long ignored by the ARRL, the ham magazines, and the general ham population that has been brainwashed into thinking that AM is dead. The potential is still there; it just cries out for use.

It is because of this continuing value of AM to the hobby that I protest the PEP power determination method that replaced the old 1-kW-dc-input rule. What is so difficult about multiplying two final amplifier parameters that caused the FCC to decide that we will all have to buy PEP power meters by 1990? Have amateurs forgotten how to do multiplication? Also, PEP has always dealt with phone transmissions. Will someone please tell me how you read the peak ENVELOPE power of a CW or FM transmission where there is no modulation envelope! The thrust of Docket 82-624 seems to be that amateur radio will eventually be turned into a CB-type service where the operators have little knowledge of the inner workings of their equipment.

No other group seems to have been singled out for so much legislative abuse. What other group will be forced to cut its power by 50%? Several times the FCC has come close to "deregulating" my favorite part of the hobby out of existence with dockets such as the power reduction or the ill-fated Docket 20777 of the mid-1970s that would have banned AM below 30 MHz by regulating bandwidth instead of restricting modes. It is this repeated legislative abuse that comes every few years that has the low-band AMers up in arms and speaking out. I for one am sick of having to fight to justify AM's existence every two or three years when some bureaucrat at the FCC or a "professional ham" at the ARRL cranks out yet another make-work deregulatory proposal to limit bandwidth to 3 kHz, cut AM power by 50%, ban AM below 30 MHz, or otherwise shut down full-carrier AM phone on the low bands so that a few more SSB appliance operators can be squeezed in to chase DX or participate in some inane contest.

AMers, myself included, are speaking out at last because we have realized that we can expect no help from the ARRL or the major ham magazines. I have not seen any mention in *QST* or *73* about the appeal of the FCC Docket 82-624 power reduction that has been filed by Glen Baxter K1MAN with the U.S. Supreme Court. It would be the first time in years that the Supreme Court has heard an FCC case involving amateur radio. AMers will continue to speak out because rumors have been circulating about various 75-meter SSB groups trying to petition the FCC to eliminate AM from the band or to restrict it to certain frequencies. Another threat to AM is the recent ARRL board discussion about sending a proposal to the FCC to establish a 160-meter band plan that would make the frequencies below 1840 kHz CW only.

AM is a mode that is relevant to today's world, and will continue to be for some time to come. It is well suited to attracting new or younger hams with limited funds or little electronic expertise into amateur radio. I say let the AMers pursue their interests unmolested and let the packeteers, SSBers, RTTYers, and CW people pursue theirs. There is room for all with cooperation. It is the diversity of operating modes and frequencies and our ability to experiment with them that distinguishes us from CB. If you destroy that, you have destroyed the hobby.

James D. Seaman WA2AJM
Guilderland Center NY

OK, you've convinced me that AM has a place in amateur radio. I will still grind my teeth every time I hear a heterodyne, though.—KW1O.

DECENT EXPOSURE

My first exposure to radio and electronics came in the late 50s when my father gave me an AM crystal set which I attached to the bedpost of my bunk bed. I spent many hours "DXing" the Midwest listening to the farm reports.

Later I saw a Hallicrafters shortwave receiver at the local appliance store. It had an AM band and three shortwave bands with little dots marking the places I should listen for foreign cities like London, Moscow, and Amsterdam. It wasn't even hooked up for demonstration, but I convinced my dad to buy it anyway. I soon found out that the little dots marked on the receiver had no correlation to the countries listed, but I did find a surprising number of stations grouped into various areas of the spectrum from 1.6 to 30 "megacycles."

I found other areas of the bands where strange men talked about Viking Rangers, Hammarlund receivers, and dipole antennas. I also heard them talk about something called "single slop-bucket," how it would ruin the bands, and how they would never change from amplitude modulation. I heard a few men using what I supposed to be "single slop-buckets" but I had trouble tuning them with my bfo. They tended to sound like Donald Duck.

This was my first exposure to amateur radio.

Later on, during my high-school days, I learned that some of the older boys had formed a "ham radio club" and were interested in teaching other boys and girls about this strange hobby. I attended several of the meetings of the club after school and found that they were teaching something called "Morse code." I had heard this strange code on my shortwave radio, but really had no interest in learning it. I wanted to talk to the men about dipole antennas and "single slop-buckets."

The boys who taught Morse told me if I wanted to talk to the men I had heard, I would have to learn the code first. I thought this was strange, but I gave it a try. Well, unfortunately, I wasn't very good at learning the code, and the boys teaching it seemed to want to pace the class for the better students. I tried for about four weeks, but finally got frustrated and gave up.

I still wanted to know about things like amplitude modulation, dipole antennas, and "single slop-bucket." I continued to listen to my shortwave radio. Soon, most of the men on the amateur bands started using "single slop-bucket," and I stopped listening to them because they all sounded like Donald Duck, and I couldn't tune them in well enough to enjoy it. Besides, I could always listen to the BBC, Switzerland, and HCJB in Quito, Ecuador.

Well, that was 20 years ago, and since that time I have gone on to a career in electronics, first as a technician, then as a supervisor, and now as a manager of quality assurance for a company in the telecommnications industry. But you know what, until I met Gordon West WB6NOA and Loraine McCarthy N6CIO, I still hadn't been able to master the Morse code.

That little detail held me back for 20 years!

But not any more. Thanks to Gordon and Loraine, the "Queen of Code," I am now N6NKN, an FCC licensed Technician-class operator (my license was in the mail when I got home yesterday).

I cannot say enough about these fine folks. Their patience, understanding, and ability to make learning code and theory fun has contributed to the hobby immeasurably.

Most of their students continue to pursue the hobby for their Technician- and General-class licenses. I'm currently trying to push back the wall I seem to have hit at 10 wpm, but soon I'm sure I'll be able to get on 40-meter phone, or CW, and talk about dipole antennas and something called packet radio.

Some of the men I hear say packet radio will ruin the bands, and that they will never give up RTTY, AMTOR, and single sideband. I guess I really haven't missed that much in 20 years, have I?

Richard J. Zolla N6NKN
Irvine CA

SOVIET SWAP

I have been very lucky! My little boy became a General at the age of 9 and my daughter became an Extra when she just turned 12. I taught them both, and then they taught each other. My son is getting ready to beat his sister's record.

Folks have asked me to write a book to help children become hams. I suspect it will really be for adults! The secret to get the kids to learn and pass amateur exams is to teach it with a story. Kids love stories to learn from and so do adults, especially if the characters remind them of themselves. Maybe that is what is needed in *73*—a monthly section devoted to kids with a good story to help them walk through magic radio land.

I am establishing a project, "Amateur Radio Children For Peace," between the USA and USSR. I am in the process of contacting some amateurs in the Soviet Union. The purpose would be to facilitate cultural relations and awareness between licensed amateur-radio operators in the early adolescent ages between both countries by scheduled on-the-air contacts. Simultaneously, on a yearly basis there would be an exchange of participants for two weeks living among the amateur-radio community in each country. The aim is to appeal to the children of both countries, with hope that friendships will be established and fostered. Since amateur radio knows no boundaries, neither should there be limitations on the communication of love and peace.

I think this may be a rather interesting project since amateur-radio operators of both our countries talk to each other every day anyway. Encouragement of such participation, especially with the children, has its obvious advantages.

I would appreciate any recommendations and support you may have to offer. I am in the process of contacting the Moscow Radio Club and the American Radio Relay League for assistance. In the meantime, I am trying the experience with my two children. You should have seen the expressions on my kids talking to RW3DP this past weekend!

Richard Niemtzow N5EV, M.D., Ph.D.
Andrews AFB MD

GOOD START

Your April editorial stirred me to sit down and comment on the TNS/Stoner proposal and give some ideas regarding the lack of growth in ham radio.

I'm not sure that I agree with all the details of the Stoner proposal, but I do agree that a code-free class of license is a must (contrary to the ARRL) to get our hobby growing by leaps and bounds. A digital class of license is a good start. I would also suggest that additional privileges could be granted according to the ability to build (even from a kit) equipment to be used on the air.

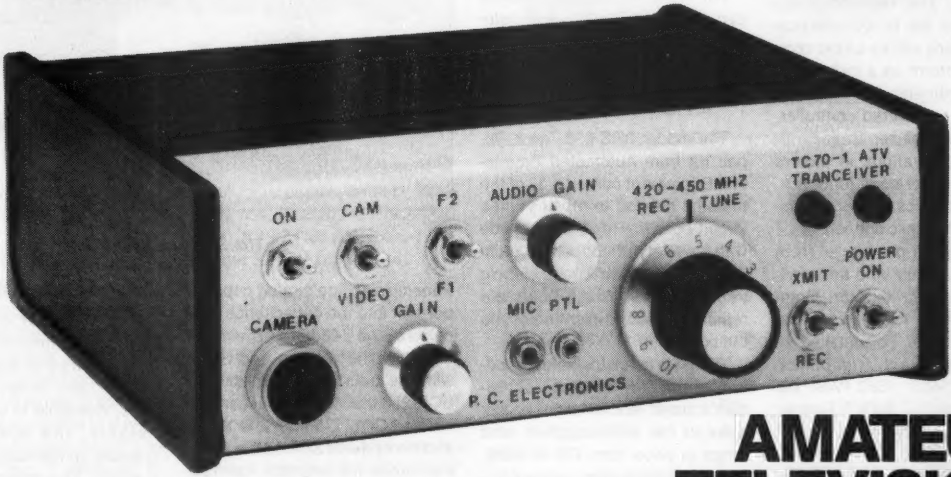
As a self-employed person engaged in parts sales and service of CB/ham/hobby electronics, I find many old-time hams are simply knob twirlers who have to pay someone to wire mikes and solder coax connectors while they sit back and complain that no one should be a ham until he learns Morse code! Vast numbers more buy parts but don't know what to do with them, go home and blow up the parts by wrong connections, and then get on the air and tell everyone that I sell bad parts—and not to patronize my business. That, after I spent time drawing out on scratch paper simple circuits for them with no charge for my time!

Ken Losey KA8RUA
Kalamazoo MI

PC ELECTRONICS

P.C. ELECTRONICS 2522 S. PAXSON LN. ARCADIA CA 91006 (818) 447-4565
TOM W6ORG MARYANN WB6YSS
Compuserve 72405,1207

✓28



AMATEUR TELEVISION

ATV MADE EASY WITH OUR SMALL ALL IN ONE BOX TC70-1 TRANSCEIVER AT A SUPER LOW $299 DELIVERED PRICE.

TC70-1 FEATURES:

- 10 pin VHS color camera and RCA phono jack video inputs.
- Crystal locked 4.5 mHz sound subcarrier.
- PTL (Push To Look) T/R switching.
- Sensitive UHF GaAsfet tuneable downconverter.
- Two frequency 1 watt pep xmtr. 1 crystal included.
- Xmit video monitor outputs to camera and phono jack.
- Small 7 x 7 x 2.5" for portable, mobile, or base.
- Draws only 500 ma (exc. camera) at 13.8 vdc.

Just plug in your camera, VCR, or computer composite video and audio, 70 cm antenna, 12 to 14 vdc, and you are ready to transmit live action color or black and white pictures. Sensitive downconverter tunes the whole 420-450 mHz band down to channel 3 on your TV set to receive. Both video carrier and sound subcarrier are crystal controlled. Specify 439.25, 434.0, or 426.25 mHz. Extra crystal $15.

WHAT ELSE DOES IT TAKE TO GET ON ATV?

Any tech class or higher amateur can get on ATV. If you already have a source of video and a TV, it costs about the same as getting on 2 meters. Now you can be seen as well as heard.

DX with TC70-1s and KLM 440-27 antennas line of sight and snow free is about 22 miles, 7 miles with the 440-6 for portable use such as parades, races, search and rescue, etc. You can add one of the two ATV engineered linear amps listed below for greater DX.

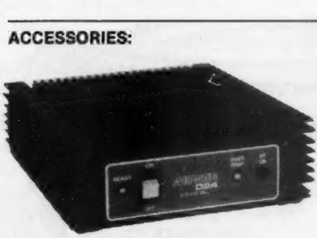
AT 70 cm, antenna height and gain is all important. Foliage can absorb much of the power. Also low loss tight braided coax such as the Saxton 8285 must be used along with type N connectors.

The TC70-1 has full bandwidth for color, sound, and computer graphics. You can now show the shack, computer programs, home video tapes and movies, repeat SSTV or even space shuttle video if you have a Home Satellite Receiver.

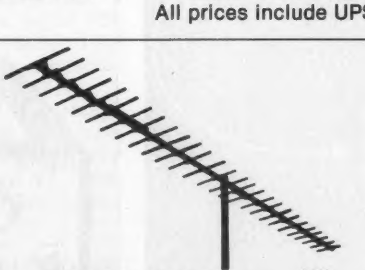
20 WATT SPECIAL . . $399

SAVE $9 on the TC70-1 & ELH-730G when purchased together.
All prices include UPS surface shipping in cont. USA.

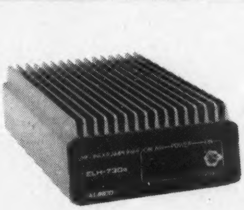
ACCESSORIES:



Mirage D24N-ATV 50 watt amp **$189**
ATV, SSB, FM. 9 amps.



KLM 440-27 14.5 dbd antenna .. **$89**
KLM 440-6 8 dbd antenna **$38**



Alinco ELH-730G 20 watt amp **$109**
ATV, SSB, FM. 4.5 amps

HAMS! Call or write for for full line ATV Catalog.

NEW PRODUCTS

ROBOTICS WORKSHOPS

A new series of robotics workshops is now available from Multibotics, Inc. The workshops are built around the B-100 interface module, which allows a host computer to perform as a motor controller, a voltmeter, a storage oscilloscope, an infrared controller, and an audio digitizer. Projects include demonstrations in motors and gears, generators, feedback, digital electronics, moving vehicles, and electronic speech.

The workshops range from $59.95 to $199.95, and are available for the Apple IIe, Atari, Commodore 64 and 128, Amiga, and IBM compatibles. For detailed information, contact *Multibotics, Inc., 2561 South 1560 West #A, Woods Cross UT 84087.* Reader Service number 152.

ORION ANTENNA ROTATORS

Orion Hi-Tech has announced the introduction of the RC5A-series of heavy-duty antenna rotators. The rotators are designed for large arrays, and employ high-tension-steel gear mechanisms. The rotors include a mast guide that makes centering easy.

For complete information, contact *Orion Hi-Tech, PO Box 8771, Calabasas CA 91302.* Reader Service number 167.

LYNX CABLE-TIE TOOL

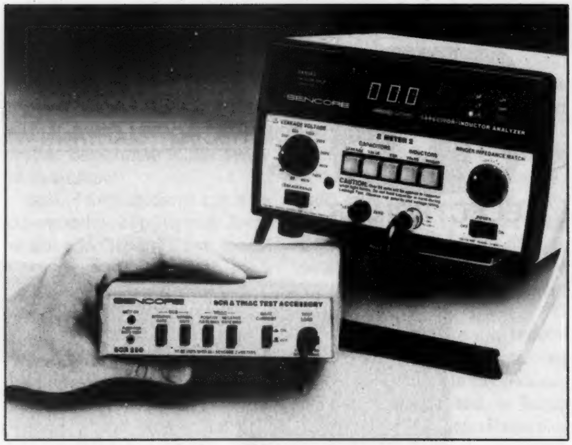
A compact, lightweight tool designed to speed up on-site installation of cable ties has been added to the Lynx product line. The QC-100 tensions, ties, and trims the tail off of cable ties with a simple twist of the user's wrist.

For more information, contact *Lynx, Inc., PO Box 67, Leominster MA 01453; (800)-222-LYNX.* Reader Service number 156.

A.P.E. PCB REPAIR KIT

The model SRS-050 Track Repair Kit from Automated Production Equipment contains all of the material needed to repair printed circuit boards. Repairs are made with a variety of copper-foil etchings that match the existing traces. Plated-through holes are repaired by swaging an eyelet into the board.

The kit is available in four models: standard, service technician's, basic, and deluxe. The kits differ in the tools supplied, and range in price from $18 to $129. For more information, contact *Automated Production Equipment Corp., 42 Peconic Ave., Medford NY 11763; (516)-654-1197.* Reader Service number 159.



The Sencore Z-Meter 2.

SENCORE Z-METER

Sencore has introduced an improved version of its popular Z-Meter, the model LC-75 Z-Meter 2. The new instrument checks capacitor value, leakage, and dielectric absorption in half the time required by the earlier unit.

The Z-Meter 2 checks capacitors from 1 picofarad to 200,000 microfarads to 1% accuracy, with full autoranging. The distance to a break in a transmission line may be determined by dividing the transmission line's rated capacity per foot into the capacitance indicated by the Z-Meter 2. The meter also can check triacs and SCRs with the addition of the optional SCR-250 triac/SCR accessory.

The LC-75 Z-Meter 2 is $995, and the optional SCR-250 is $148. For more information, contact *Sencore, Inc., Sioux Falls SD 57107; (605)-339-0100.* Reader Service number 154.

LARSEN 2M PORTABLE WHIP

Larsen Electronics has introduced the model KD14-2M-HW Kulduckie™ 2-meter portable whip. The antenna is cut for 144–148 MHz, and collapses from its extended length of 41 inches to an easy-to-carry 7-3/4 inches. The KD14-2M-HW employs a resonant half-wave design, with a rigid impedance transformer at its base. It connects to a standard BNC jack.

For more information, please contact *Larsen Electronics, PO Box 1799, Vancouver WA 98668; (206)-573-2722.* Reader Service number 151.

ALUMA TOWERS

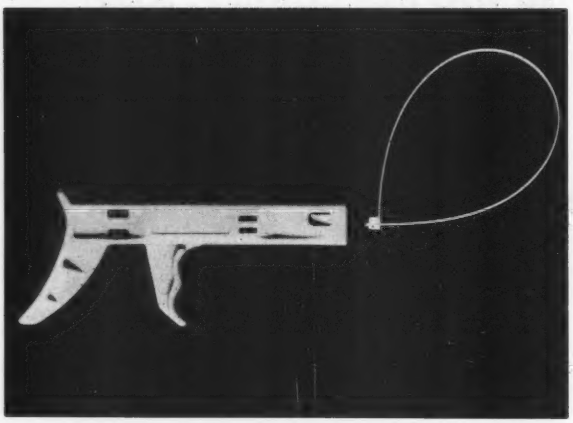
Aluma Tower offers trailer-mounted communication towers, ideal for mobile testing, site selection, and temporary installations. Available in up to 100-foot heights, the towers can be cranked up manually or with a 12-V winch. The trailers come complete with a 2″-ball hitch, spring suspension, and taillights.

For additional information about Aluma towers, contact the company at *1643 Old Dixie Highway, Vero Beach FL 32961; (305)-778-0606.* Reader Service number 158.

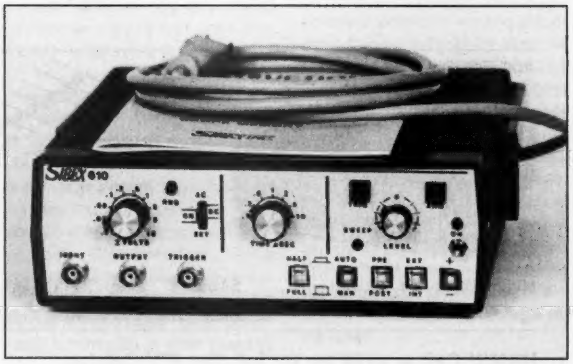
SIBEX SCOPE MEMORY

Sibex, Inc., has announced the model 610 oscilloscope memory. The model 610 has a 10-MHz maximum sampling rate and can store signals with a frequency of up to 1 MHz. Input sensitivity is 10 mV/division. The unit features pre- and post-triggering and a digital sweep function.

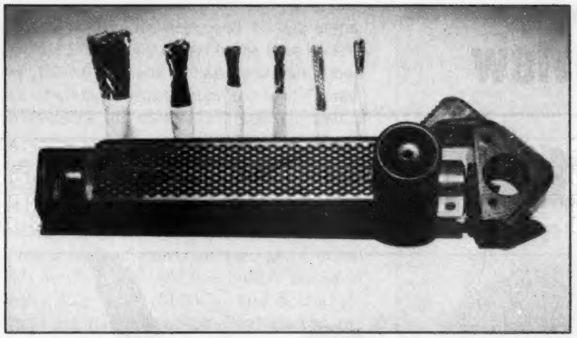
The model 610 memory unit is available for $985 from *Sibex, Inc., 3320 U.S. 19 North, Suite*



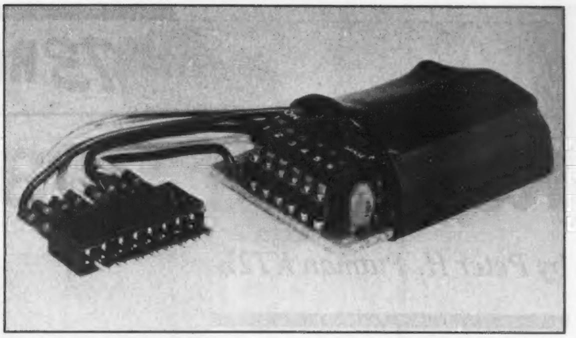
Cable-tie tool from Lynx.



The Sibex model 610 oscilloscope memory.



The CO-AX3 coaxial stripper by Davle Tech.



Selectone's ST-138W CTCSS encoder/decoder for Regency portable radios.

410, Clearwater FL 33519. Reader Service number 153.

BIRD BOOK

A new 60-page catalog of Thrulineoreg directional wattmeters, coax load resistors, calorimeters, and rf components is available from Bird Electronic Corporation. The catalog includes a comprehensive reference guide to rf measurement instrumentation and components from 2 milliwatts to 250 kilowatts in the range of 0.235–2,300 MHz, featuring triple-indexing by function, power level, and model number.

The publication is free—ask for GC-86 from *Bird Electronic Corporation, 30303 Aurora Road, Cleveland OH 44139; (216)-248-1200.* Reader Service number 160.

KENT MORSE KEY

R.A. Kent of Great Britain offers a solid brass Morse key in kit form. The machined hardwood base measures 8" x 3" x 1-1/2", and the solid brass arm is 6" long x 1/2" x 1/2". The key features ball race bearings and solid silver contacts.

For more information, please contact *R.A. Kent, 243 Carr Lane, Tarleton, Preston, Lancs PR4 6YB, Great Britain; (0774-73)-4998.* Reader Service number 161.

DAVLE TECH COAX STRIPPER

The CO-AX3 is a new coaxial-cable stripper designed for accurate removal of the outer sheath from twisted-pair coax and other irregularly shaped cables. A spring-loaded cutting head follows the contour of the cable, giving a precise cut to a specified depth. The cutting blade may be rotated 90 degrees to make a longitudinal cut, and a retractable ripping blade aids in splitting open cable insulation.

For more details, contact *Davle Tech, Inc., 2-05 Banta Place, Fair Lawn NJ 07410; (201)-796-1720.* Reader Service number 162.

NYE QRG DISPLAY

The Nye-Viking QRG Display is a VHF/UHF frequency counter with six big red digits which display your listening frequency. An automatic offset is built in for the 144-, 220-, and 440-MHz bands, with a remote switch for simplex or duplex operation.

The display is designed to be installed in the rear window of a car. The display remains dark until you transmit for at least four seconds, then the display will light up, showing the frequency you are listening on. The QRG Display can also be wired into the car's brake lights—six red eights appear when the brakes are hit.

For complete information about the QRG Display, write *Wm. M. Nye Company, 1614 130th Avenue NE, Bellevue WA 98005.* Reader Service number 163.

HAMTRONICS CATALOG

Hamtronics' latest catalog is ready for mailing. The 40-page, two-color catalog features many new products, including new GaAsFET preamps, a five-function DTMF decoder/controller, a T/R relay module, digital FSK modulators/demodulators for computer interfacing, and packet-radio VHF power amplifiers.

For a copy of the catalog, please send $1 ($2 for overseas mailing) to *Hamtronics, Inc., 65-F Moul Road, Hilton NY 14468-9535.* Reader Service number 164.

CTCSS ENCODER/DECODER

A new DIP-switch-programmable CTCSS encoder/decoder for Regency portable radios is now available from Selectone. The model ST-138W Digitone™ unit measures only 0.15" x 1.05" x 0.4" and comes wired with an 8-pin connector which mates with the tone-option harness in the Regency MCPH-, MCPU-, and NC-102-series portables.

The ST-138W draws less than 7 mA at 5.6 to 26 V dc and provides 38 CTCSS tones from 67.0–250.3 Hz. It includes a high-pass filter and crystal control for accuracy and stability.

You can receive more information about the ST-138W by contacting *Selectone Corp., 23278 Bernhardt Street, Hayward CA 94545; (415)-887-1950.* Reader Service number 157.

INTER-EAR COMM SYSTEM

Ace Communications, Inc., has augmented their line of in-the-ear listening devices to include a unit which also transmits. The IECS-200 replaces the speaker/microphone on an HT and allows hands-free communications in noisy environments. The IECS-200 will interface with any radio that has an external speaker and microphone jack.

For complete details, write or call *Ace Communications, Inc., 22511 Aspan Street, Lake Forest CA 92630-6321; (714)-581-4900.* Reader Service number 155.

The IECS-200 inter-ear speaker/microphone by Ace Communications.

COAXIAL DYNAMICS WATTMETER, FS METER

Coaxial Dynamics has introduced two new meters to their product line. The 83000-A peak-reading wattmeter features a measuring capability of from 0.1 to 5,000 Watts in the 2–1,000-MHz range with plug-in elements.

The model 7600 field-strength meter offers high sensitivity, broadband operation, detachable antennas, adjustable gain control, and a large meter. Its frequency range is from 1 to 1,000 MHz.

You can get additional information on these and other rf products by contacting *Coaxial Dynamics, Inc., 15210 Industrial Parkway, Cleveland OH 44135; (216)-267-2233 or (800)-COAXIAL.* Reader Service number 165.

R-2000 REPEATER CONTROLLER

Resultant Engineering has introduced the R-2000 microprocessor-based repeater controller. The R-2000 features an easy-to-use touchtone™ command language, over 30 user operations, a voice synthesizer which responds to your commands with interactive messages, a real-time clock, on-board subaudible-tone and DTMF decoders, autopatch, a mailbox and a bulletin board, two RS-232C ports, a watchdog circuit, and CMOS construction with battery-backed RAM.

For complete details, contact *Resultant Engineering, 175 East Homestead, Suite 5, Sunnyvale CA 94087; (408)-732-9482.* Reader Service number 166.

Kenwood TH-31AT

by Peter H. Putman KT2B

Trio-Kenwood
Corporation
1111 West Walnut St.
Compton CA 90220
Price class: $235

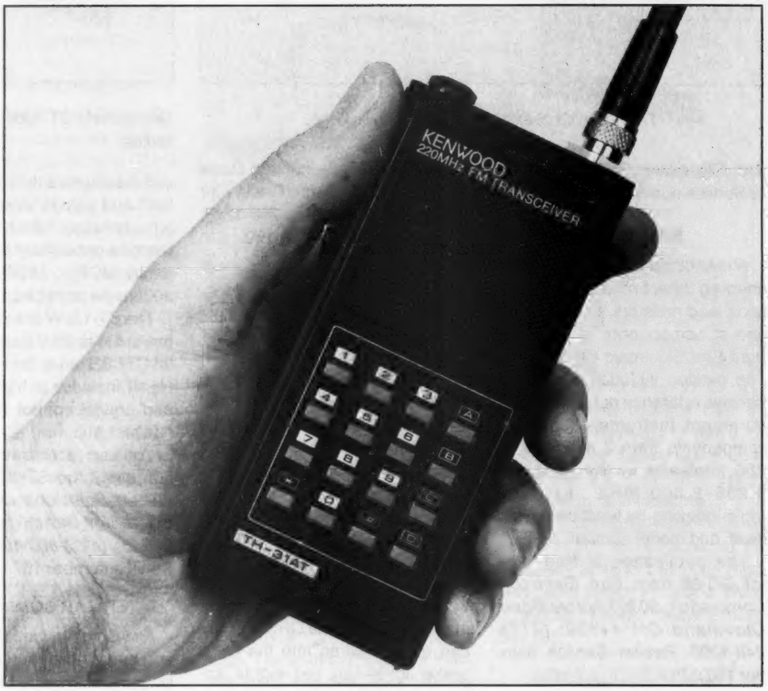


Photo A. The TH-31AT: "slight" of hand?

Oops! Now where did that handie-talkie get off to? Nope, not in my pocket, not in the drawer, not under the bed.... Ahhh, there it is. It slipped under the crack in the door!

Not to be facetious, but this is truly the smallest radio I've ever used. It sort of resembles a microphone with an antenna attached! Yet, the Kenwood TH-31AT will yield hours of operating enjoyment on 220-MHz FM.

This was truly an impulse purchase. While at the LIMARC hamfest on Long Island in February, I felt some money burning a hole in my wallet, so it was a short time before said cash and I were soon parted. I wound up with the basic radio plus an extra battery pack as a bonus from the dealer. In addition, I purchased a third pack for backup. I also bought the AJ-3 antenna-conversion plug (more on this later) as well as the DC-21 dc power converter. A Larsen magnetic mount and 5/8-wave whip rounded out the deal.

What's In It?

As soon as I opened up the box, I was amazed by the small size of the radio without the slide-on battery pack. With the standard pack, the TH-31AT measures in at 4-3/4" tall by 2-3/8" wide by 1-1/4" deep. That's not a lot bigger than a cigarette pack. In fact, the rubber-duck antenna is taller than the transceiver! The PB-21 battery pack measures in at 2-3/4" tall by 1/2" thick, so you can see that there isn't a lot of room for the guts of the radio.

Kenwood rates the radio at 1 Watt output across 50 Ohms in the high-power position. Using a Bird 43 and a 5-Watt 100–250-MHz slug, I measured 750 mW with three differently charged batteries. The supplied pack is rated at 7.2 volts, so I experimented with an outboard dc converter that supplied 8.5 volts, but no change was apparent in output. Low power is rated at 100 mW and this appears to be the case, based on the Bird measurements.

Battery life is estimated by Kenwood to be about 90 minutes using alkaline batteries with a 1-minute-TX/3-minute-RX cycle. How this relates to NiCd usage I don't know, but in my experience with a 1-minute-TX/3-minute-RX cycle, my batteries lasted about half an hour. Of course, I spend most of my time just listening, which made the batteries last considerably longer. I strongly suggest you use the DC-21 or some sort of outboard dc converter to save your batteries when you operate from the car or from home.

Here in the shack, I hooked up a Mirage C22 amplifier I had from a previous project to a dc power supply and connected an LM-317 adjustable regulator to the DC-21 battery connection. I set the voltage at 8 volts and ran the output of the TH-31AT into the Mirage amplifier. This feeds a KLM 7-element yagi on one of my two masts, and does an exemplary job of accessing local repeaters.

The TH-31AT is configured for simplex, −1.6-MHz offset and +1.6-MHz reverse offset, selectable from a tiny switch on the back panel. You shouldn't try to change the configuration while you're driving, however. Nor should you try to change the thumbwheel frequency selector while in the car. The Japanese must have incredibly tiny fingers! The thumbwheel isn't backlit, so you'll need to change it by feel in the dark or under low-light conditions.

The receiver is rated at 0.5 uV for 12-dB Sinad, and I wasn't in a position to challenge this claim. The unit is sensitive. It compares favorably with my Microwave Module, which has a MOSFET front end. Squelch sensitivity is rated at less than 0.2 uV and, again, I wasn't in a position to challenge the claim. The antenna connector is somewhat unique: It's a threaded RCA connector! I'm not sure why Kenwood settled on this type of plug, as a BNC jack really wouldn't have used any more room. Perhaps it's because the RCA connector presents a lower profile. But it will play havoc with an external antenna unless you purchase the AJ-3 adapter (threaded RCA to BNC female). With the AJ-3, you can use mobile antennas or hook into an external power amplifier.

Other features include an optional tone module for tone burst (TU-6), which is activated by a top-cover switch. The thumbwheels tune in 1-MHz, 100-kHz, and 10-kHz steps, with a +5-kHz switch next to the tone switch. An LED keeps track of battery life and goes out when the voltage drops too low. Finally, connections for an external speaker and a microphone are found on the top cover, and Kenwood supplies an external speaker/mike (SMC-30) as well as a headset with VOX (HMC-1). Unfortunately, the plugs are reversed from the ICOM speaker/mike's and spaced further apart, so you can't cheat with another unit. Alkaline battery packs, a heavy-duty pack (SUM-2), and a charger round out the accessories. Boy, this can get expensive!

Operation

Now for the hands-on critique. The size definitely takes some getting used to. The controls are so tiny, for example, that you really have to look carefully to make sure you have selected the right offset. I'd also feel comfortable with a somewhat more responsive DTMF pad, as there is no tactile "click" when you depress the keys. Another complaint is the pressure needed to keep the PTT switch fully depressed. I have been in the middle of a QSO when the PTT dropped out on me, since I hadn't been maintaining a steady pressure on the switch. Again, this is due solely to the lack of a positive feel when depressing the switch. Whether this is a problem due to the size of the rig, I don't know.

The audio output is more than adequate for hand-held use (250 mW across 8 Ohms) but is not going to hack it in noisy mobile operation. An outboard power-amp module would be called for here. I use the unit barefoot into a Larsen 5/8-wave antenna with the DC-21 dc adapter and can work many repeaters full-quieting. This may be due to the fact that several of them have GaAsFETs in the front end, but, whatever the reason, it makes mobiling a pleasure. Since the radio isn't much larger than my Kenwood MC-45 microphone for my TR-7400, it's more like using a microphone—not an HT. Best of all, if you have to park your car in an unsafe area, the unit and dc converter can go in your coat pocket or briefcase. In fact, the TH-series HTs are ideal for traveling in general!

To summarize, the Kenwood TH-31AT is a fun, easy-to-use radio for 220-MHz FM, although the controls may take some getting used to. The wide range of accessories makes it very adaptable for mobile and base-station operation, but you're likely to forget where you left it last due to its size! I suspect this would be a very popular radio with Novices should they ultimately get 220-MHz privileges. As for myself, the biggest problem is keeping the dog from using it as a toy and remembering not to sit on it when it's in my back pocket. One outstanding application for me is to use this HT as a low-power 220 communications link at large hamfests, such as Dayton, since the whole thing slips unobtrusively into a shirt pocket and the earphone is the only external connection. I also understand that Kenwood has now come out with a quick-charger that can hold two packs, and this can only add to the functionality of the radio. ■

Photo B. "Crescent," my Labrador Retriever shows relative size.

Heathkit HD-3030 Interface

by Marc Stern N1BLH

Heath Company
Dept. 150-735
Benton Harbor MI 49022
$199.95

There's an old saying in our ranks that goes something like this: "If you want to learn about the hobby, build something." It's a saying that had validity 30 years ago and that is still true today, to a large extent.

Of course, the kits of 30 years ago were large and complex and were state-of-the-art for the time, but they were kits you could really get your hands on because of the tubes and large components used. Contrast this with the kits of 1986, which feature integrated-circuit technology and printed circuit boards stuffed with tiny components. The difference is like day and night.

But, while it may not now be possible to build and debug each circuit—many of them are contained within IC flatpacks—kit building still gives you the chance to learn how a component functions within a specific overall device and how to handle IC components without fear. That, perhaps, is today's greatest lesson with kit building.

Thirty years ago, of course, one could attack each part of a circuit, check its performance, and improve on it. This was due to the nature of the components used. To a large extent, this defined the saying about kit building and learning. But those days are gone, and perhaps the primary reason anyone builds a kit today is not so much for a learning experience as for fun.

This is why I recently undertook the building of the Heathkit HD-3030 RTTY/CW interface. I enjoy kit building and wanted to add something to my shack that would increase its versatility, which the 3030 has done.

There was another reason I chose the 3030: It has been a couple of years since I last built a kit—no time really—and I wanted to handle something that wasn't overly complicated but that presented enough challenge to keep my interest. The 3030 came through with flying colors on both scores.

Organization

As you would expect, when the 3030 made its appearance here, I immediately ripped the box open and checked things out. The first thing I noticed was the organization. When I built my last Heathkit, everything was loaded into the box in a manner that made little sense. I had to sort through boxes and bags of resistors, capacitors, and diodes, as well as hardware and other goodies, and set things aside. Then I had to check everything against the manual, which was time-consuming.

The HD-3030, on the other hand, came well organized. The major subsystems were packaged together in the box, so all I had to do was

Heathkit
TERMINAL INTERFACE
HD 3030

Photo A. The Heathkit HD-3030 RTTY/CW interface.

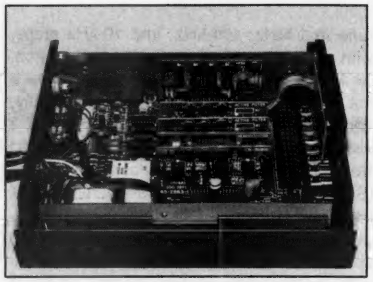


Photo B. The HD-3030 with boards intact.

move from subassembly one to seven, checking the components as I went. I then left each subsystem in its cardboard divider and went to work. This organization made things much easier, and I was able to jump into building this device quite quickly.

Construction

The first task was building the CW and RTTY demodulator boards, as well as the AFSK generator and the 2125- and 2295-Hz-shift boards, which give the 3030 its standard 170-Hz shift. These daughterboards are meant to plug into the motherboard via a 15-pin connector.

These boards took me about five hours to finish. I probably could have done them more quickly, but I took my time, not wanting to hurry things. Next, I moved on to the motherboard, which took me about another five hours in total.

At this point, I put the box together, made the required mechanical connections, and put the 3030 through its first smoke test. And, just as you'd expect, the smoke leaked right out of the device on the first go-around. I retraced my steps and everything looked as if it was correct, so I tried it again. This time nothing happened.

Well, I had to make the first of several calls to customer support. After I told them the symptoms and the findings of my own troubleshooting, they diagnosed the problem as lying in the voltage-regulator section. (Actually, I isolated the problem to one of the three regulators—7805, 7812, 7912—fairly quickly, and the customer service technicians at Heath confirmed my diagnosis, although none of us could figure out exactly what was going wrong.)

The upshot of this was that the call produced replacement components which were shipped promptly. The funny thing is that the same component kept on blowing all the time—the 7912—and although everything looked correct, it really wasn't. As I looked at the documentation for what seemed the thousandth time, I noticed there were two nylon screws included with the kit, but only one had been used. As I looked further, I noticed that one was supposed to have been used with the 7912. So, as usual, pilot error crept into the picture. When I put the new 7912 into position and replaced the metal screw that had caused the short with the nylon screw, the 3030 came to life.

Following the manual—once I had the device working, that is—I quickly aligned each board and set the 3030 up to work. Like all Heathkits, the manual is comprehensive and presents not only the building instructions, but also setup, alignment, and theory of operation. The documentation also includes a comprehensive breakout pictorial of each major subassembly and its construction, as well as a block diagram and schematic diagram. There are also X-ray views of each board.

Operation

Overall, the HD-3030 is a very competent interface with a good set of specifications. For example, the center frequency of the CW demodulator is 750 Hz, while the −3-dB bandwidth is 70 Hz. The −20-dB bandwidth is 240 Hz.

The 3030 is a universal interface in that it will work with a variety of personal computers. It just depends on the software you're using to drive it. Heath offers its own software, compatible with the H-8 and H/Z-89 computers, and many other programs are available for other personal computers. I used the 3030 with a public-domain IBM Personal Computer program, and it performed quite well.

Tune-up is easy thanks to the multi-segment bar-graph display. The front panel also controls choice of CW or RTTY and shift selection. The built-in shift is 170 Hz, although 425- and 850-Hz-shift boards are available as options, as is a preselector board that increases the sensitivity of the unit.

The 3030 is also compatible with TTL or RS-232 voltages, and a loop supply is a user option. The rear panel contains connectors for ground, an auxiliary ac output, the loop, and the interface connector.

The interface connector is a standard miniature DB-25 connector that Heath has used for its own purposes. It provides three RS-232-level outputs and inputs, as well as TTL-level outputs and inputs. There are also scope outputs for mark and space.

Altogether, I was quite impressed with the unit and the way it fit into my shack. But, there are a couple of aspects that I must comment on—the interface connector and the option boards.

Although I have no problem with Heath using a serial-type interface connector on the 3030 (a DB-25), I do have a problem with the way some of the input and output lines were implemented. Using the same connector for both inputs and outputs means you will have a tough time putting a cover on the connector body. The reason, quite simply, is the necessity of extra wire coming from the connector so that you can key the rig for RTTY or CW. It wasn't an easy task to cover the connector without crushing the wires. It would have been better if Heath had opted for RCA or phone-jack connectors for these outputs.

And I think Heath is unwise in offering the 425- and 850-Hz-shift boards as extra-cost options. In fact, I suspect this will probably hurt sales more than help because other units on the market are less expensive than the HD-3030 and offer the "standard" 170-Hz amateur shift and the commercial 425- and 850-Hz shifts as part of their packaging. You don't have to add it later or pay extra for it. In fact, other less expensive units have variable shift to 850 Hz. So, if you're thinking of this unit, be aware of the necessity for these optional boards, although I did find it will function quite nicely without them by using the mark frequency and tuning around it.

Overall, the HD-3030 is a competent unit that does offer a learning experience. No, you won't learn all about the hobby from it, but you will learn about parts of it and about the proper handling of integrated-circuit technology, something we must know in this day of microprocessors.

Reader Service number 150.■

NEW! Lower Price Scanners

Communications Electronics,™ the world's largest distributor of radio scanners, introduces new lower prices to celebrate our 15th anniversary.

Regency‡ MX7000-EA

List price $699.95/**CE price $399.95/SPECIAL**
10-Band, 20 Channel • Crystalless • AC/DC
Frequency range: 25-550 MHz. continuous coverage and 800 MHz. to 1.3 GHz. continuous coverage.
The *Regency* MX7000 scanner lets you monitor military, F.B.I., Space Satellites, Police and Fire Departments, Drug Enforcement Agencies, Defense Department, Aeronautical AM band, Aero Navigation Band, Fish & Game, Immigration, Paramedics, Amateur Radio, Justice Department, State Department, plus thousands of other radio frequencies most scanners can't pick up. The *Regency* MX7000 is the perfect scanner for intelligence agencies that need to monitor the new 800 MHz. cellular telephone band. The MX7000, now at a special price from CE.

Regency® Z60-EA

List price $299.95/**CE price $179.95/SPECIAL**
8-Band, 60 Channel • No-crystal scanner
Bands: 30-50, 88-108, 118-136, 144-174, 440-512 MHz.
The *Regency* Z60 covers all the public service bands plus aircraft and FM music for a total of eight bands. The Z60 also features an alarm clock and priority control as well as AC/DC operation. Order today.

Regency® Z45-EA

List price $259.95/**CE price $159.95/SPECIAL**
7-Band, 45 Channel • No-crystal scanner
Bands: 30-50, 118-136, 144-174, 440-512 MHz.
The *Regency* Z45 is very similar to the Z60 model listed above however it does not have the commercial FM broadcast band. The Z45, now at a special price from Communications Electronics.

Regency® RH250B-EA

List price $613.00/**CE price $329.95/SPECIAL**
10 Channel • 25 Watt Transceiver • Priority
The *Regency* RH250B is a ten-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to ten frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH250 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A UHF version of the same radio called the RU150B covers 450-482 MHz. but the cost is $449.95. To get technician programming instructions, order a service manual from CE with your radio system.

NEW! Bearcat® 50XL-EA

List price $199.95/**CE price $114.95/SPECIAL**
10-Band, 10 Channel • Handheld scanner
Bands: 29.7-54, 136-174, 406-512 MHz.
The Uniden Bearcat 50XL is an economical, hand-held scanner with 10 channels covering ten frequency bands. It features a keyboard lock switch to prevent accidental entry and more. Also order part # **BP50** which is a rechargeable battery pack for $14.95, a plug-in wall charger, part # **AD100** for $14.95, a carrying case part # **VC001** for $14.95 and also order optional cigarette lighter cable part # **PS001** for $14.95.

NEW! Regency® XL156-EA

List price $239.95/**CE price $129.95/SPECIAL**
6-Band, 10 Channel • No-crystal Scanner
Search • Lockout • Priority • AC/DC
Bands: 30-50, 144-174, 440-512 MHz.
Cover your choice of over 15,000 frequencies on 10 channels at the touch of your finger. Display messages. External speaker jack. Telescoping antenna. External antenna jack. AC/DC.

NEW! Regency® R1060-EA

List price $149.95/**CE price $92.95/SPECIAL**
6-Band, 10 Channel • Crystalless • AC only
Bands: 30-50, 144-174, 440-512 MHz.
Now you can enjoy computerized scanner versatility at a price that's less than some crystal units. The *Regency* R1060 lets you in on all the action of police, fire, weather, and emergency calls. You'll even hear mobile telephones.

Bearcat® DX1000-EA

List price $649.95/**CE price $349.95/SPECIAL**
Frequency range 10 KHz. to 30 MHz.
The *Bearcat* DX1000 shortwave radio makes tuning in London as easy as dialing a phone. It features PLL synthesized accuracy, two time zone 24-hour digital quartz clock and a built-in timer to wake you to your favorite shortwave station. It can be programmed to activate peripheral equipment like a tape recorder to record up to five different broadcasts, any frequency, any mode, while you are asleep or at work. It will receive AM, LSB, USB, CW and FM broadcasts.

There's never been an easier way to hear what the world has to say. With the *Bearcat* DX1000 shortwave receiver, you now have direct access to the world.

NEW! Regency® HX1200-EA

List price $369.95/**CE price $214.95/SPECIAL**
8-Band, 45 Channel • No Crystal scanner
Search • Lockout • Priority • Scan delay
Sidelit liquid crystal display • EAROM Memory
New Direct Channel Access Feature
Bands: 30-50, 118-136, 144-174, 406-420, 440-512 MHz.
The new handheld *Regency* HX1200 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 45 channels at the same time including the AM aircraft band. The LCD display is even sidelit for night use. Order **MA-256-EA** rapid charge drop-in battery charger for $84.95 plus $3.00 shipping/handling. Includes wall charger, carrying case, belt clip, flexible antenna and nicad battery.

NEW! Bearcat® 100XL-EA

List price $349.95/**CE price $203.95/SPECIAL**
9-Band, 16 Channel • Priority • Scan Delay
Search • Limit • Hold • Lockout • AC/DC
Frequency range: 30-50, 118-174, 406-512 MHz.
The world's first no-crystal handheld scanner now has a LCD channel display with backlight for low light use and aircraft band coverage at the same low price. Size is 1⅜" x 7½" x 2⅞." The *Bearcat* 100XL has wide frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the AM aircraft band, the 2-meter and 70 cm. amateur bands, *plus* military and federal government frequencies. Wow...what a scanner!

Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Order your scanner now.

Bearcat® 210XW-EA

List price $339.95/**CE price $209.95/SPECIAL**
8-Band, 20 Channel • No-crystal scanner
Automatic Weather • Search/Scan • AC/DC
Frequency range: 30-50, 136-174, 406-512 MHz.
The new Bearcat 210XW is an advanced third generation scanner with great performance at a low CE price.

NEW! Bearcat® 145XL-EA

List price $179.95/**CE price $102.95/SPECIAL**
10 Band, 16 channel • AC/DC • Instant Weather
Frequency range: 29-54, 136-174, 420-512 MHz.
The *Bearcat* 145XL makes a great first scanner. Its low cost and high performance lets you hear all the action with the touch of a key. Order your scanner from CE today.

TEST ANY SCANNER

Test any scanner purchased from **Communications Electronics**™ for 31 days before you decide to keep it. If for any reason you are not completely satisfied, return it in original condition with all parts in 31 days, for a prompt refund (less shipping/handling charges and rebate credits).

NEW! Bearcat® 800XLT-EA

List price $499.95/**CE price $317.95**
12-Band, 40 Channel • No-crystal scanner
Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½."

OTHER RADIOS AND ACCESSORIES

Panasonic RF-2600-EA Shortwave receiver	$179.95
RD95-EA *Uniden* Remote mount Radar Detector	$128.95
RD55-EA *Uniden* Visor mount Radar Detector	$98.95
RD9-EA *Uniden* "Passport" size Radar Detector	$239.95
BC210XW-EA *Bearcat* 20 channel scanner **SALE**	$209.95
BC-WA-EA *Bearcat* Weather Alert™	$49.95
DX1000-EA *Bearcat* shortwave receiver **SALE**	$349.95
PC22-EA *Uniden* remote mount CB transceiver	$99.95
PC55-EA *Uniden* mobile mount CB transceiver	$59.95
R1060-EA *Regency* 10 channel scanner **SALE**	$92.95
MX3000-EA *Regency* 30 channel scanner	$198.95
XL156-EA *Regency* 10 channel scanner **SALE**	$129.95
UC102-EA *Regency* VHF 2 ch. 1 Watt transceiver	$124.95
RH250B-EA *Regency* 10 ch. 25 Watt VHF trans.	$329.95
RH600B-EA *Regency* 10 ch. 60 Watt VHF trans.	$454.95
RU150B-EA *Regency* 10 channel UHF transceiver	$449.95
RPH410-EA 10 ch. handheld no-crystal trans.	$399.95
LC10-EA Carrying case for RPH410 transceiver	$34.95
MA181-EA Ni-cad battery pack for RPH410 trans.	$34.95
P1405-EA *Regency* 5 amp regulated power supply	$69.95
P1412-EA *Regency* 12 amp reg. power supply	$164.95
BC10-EA Battery charger for *Regency* RPH410	$84.95
MA256-EA Drop-in charger for HX1000 & HX1200	$84.95
MA257-EA Cigarette lighter cord for HX1200	$19.95
MA917-EA Ni-Cad battery pack for HX1200	$34.95
EC10-EA Programming tool for *Regency* RPH410	$24.95
SMRH250-EA Service man. for *Regency* RH250	$24.95
SMRU150-EA Service man. for *Regency* RU150	$24.95
SMRPH410-EA Service man. for *Regency* RPH410	$24.95
SMMX7000-EA Svc. man. for MX7000 & MX5000	$19.95
SMMX3000-EA Service man. for *Regency* MX3000	$19.95
B-4-EA 1.2 V AAA Ni-Cad batteries (set of four)	$9.95
FB-E-EA Frequency Directory for Eastern U.S.A.	$12.95
FB-W-EA Frequency Directory for Western U.S.A.	$12.95
TSG-EA "Top Secret" Registry of U.S. Govt. Freq.	$14.95
TIC-EA Techniques for Intercepting Comm.	$14.95
RRF-EA Railroad frequency directory	$10.95
CIE-EA Covert Intelligenct, Elect. Eavesdropping	$14.95
A60-EA Magnet mount mobile scanner antenna	$35.00
A70-EA Base station scanner antenna	$35.00
USAMM-EA Mag mount VHF/UHF ant. w/ 12' cable	$39.95
USAK-EA ¾" hole mount VHF/UHF ant. w/ 17' cable	$35.00
USATLM-EA Trunk lip mount VHF/UHF antenna	$35.00

Add $3.00 shipping for all *accessories* ordered at the same time.
Add $12.00 shipping per shortwave receiver.
Add $7.00 shipping per scanner and $3.00 per antenna.

BUY WITH CONFIDENCE

To ***get the fastest delivery from CE*** of any scanner, send or phone your order directly to our Scanner Distribution Center.™ Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. A $5.00 additional handling fee will be charged for all orders with a merchandise total under $50.00. Shipments are F.O.B. Ann Arbor, Michigan. No COD's. Most products that we sell have a manufacturer's warranty. Free copies of warranties on these products are available prior to purchase by writing to CE. Non-certified checks require bank clearance.

Mail orders to: Communications Electronics,™ Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add $7.00 per scanner for U.P.S. *ground* shipping and handling in the continental U.S.A. For Canada, Puerto Rico, Hawaii, Alaska, or APO/FPO delivery, shipping charges are three times continental U.S. rates. If you have a Visa or Master Card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-USA-SCAN. In Canada, order toll-free by calling 800-221-3475. Telex CE anytime, dial 810-223-2422. If you are outside the U.S. or in Michigan dial 313-973-8888. Order today.

Scanner Distribution Center™ and CE logos are trademarks of Communications Electronics Inc.
† *Bearcat* is a registered trademark of Uniden Corporation.
‡ *Regency* is a registered trademark of Regency Electronics Inc.

AD #040186-EA

Copyright © 1986 Communications Electronics Inc.

For credit card orders call 1-800-USA-SCAN

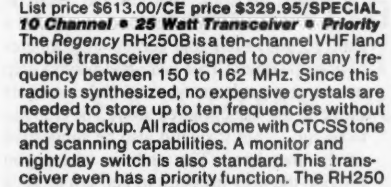
59

COMMUNICATIONS ELECTRONICS INC.

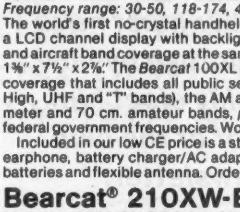
Consumer Products Division

P.O. Box 1045 ☐ Ann Arbor, Michigan 48106-1045 U.S.A.
Call 800-USA-SCAN or outside U.S.A. 313-973-8888

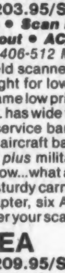
Regency RH250



Regency MX7000



Regency HX1200



Wayne Green W2NSD/1

How To Build A Great Ham Club

When ham club meeting night comes along, do you have a problem with priorities? Should you go to the club meeting or the dentist? Or perhaps a visit to your mother-in-law? Tough decision. The answer is to get the heck down to the club meeting and get the club off its collective ass. You can make the club so much fun the members will be fighting to have weekly meetings instead of monthly. Now stop sitting there wringing your hands, hoping someone else will do it.

Yes, I do a lot of things. You know why? Well, every time I look around and say to myself, gee, someone really should do something about so and so...I realize that, heck, *I'm* someone. So I go ahead and do it. It's amazing how much you can get done when you decide to do it.

For instance, I've been writing about your taking off a few weeks in October and coming on a little DXpedition to Asia with me. You know it would be a lot of fun, but you aren't into making big decisions like that. Phooey. Sure, I know, you're a bit tight on money—and you don't know if they'd let you take that much vacation. I'm sure you can come up with a half-dozen good reasons for not doing something. My friend, you only have one trip through this life, so isn't it time you started making some decisions which will add to your life? I'm going to have a ball in Asia and you should be there with me having fun.

Show Biz

Okay, let's apply that concept to getting your ham club going like gangbusters. I said to stop wringing your hands—let's get to work on this. The first thing you have to understand about ham clubs...about any clubs...is that you're in show business. It's basic—if the members don't have fun they aren't going to come back. Think about it.

What's fun to do at radio club meetings? One fun thing is to get to talk with your fellow hams. Have you built that part into your club meeting? Give 'em some refreshments about half way through the meeting and maybe twenty minutes to chew the rag. Coffee and assorted doughnuts are good fare...or fresh cider and doughnuts. Have you an XYL or two in the club who can make a homemade coffee cake?

A meeting can be made fun if you can find a good speaker. Is there a ham manufacturer or dealer within reasonable commuting distance of your club? Ask him to come in to show and tell the members about his product.

A hint on the care and feeding of speakers...take care of them and feed them. Get maybe three or four members of the club to have dinner with the speaker before the meeting. Pay for his dinner, you tightwad. If you're driving him to the meeting from the restaurant, you might have a two-meter rig in the car with the members talking up the meeting over the repeater. This will give him the impression that you have a live group.

> ***"At least one club member must have a Macintosh by now. Quickly elect him editor of the club newsletter."***

Once you're at the meeting place be sure that many of the members come up to the speaker and introduce themselves to him—perhaps with some compliments on his product. Get him off to a good positive start. I hate to think of how many club meetings I've been to where the members all were busy talking with each other and ignored me completely. Start the meeting on time.

How do you get the slow arrivers to stop straggling in late? Hold the door prize drawing first instead of last. A couple times missing the drawing and you'll find 'em remarkably punctual.

If you really must have a business meeting, keep it to under ten minutes. You should do this anyway, for nothing kills a club like extended business meetings. No good can come of it. Let the executive committee handle the business and give the club a fast report.

If you want your speaker to be interesting he has to be the star for the evening. Get him on early. Take the time to give him a good introduction. Give him any help he needs to demonstrate his product.

If you've a shortage of ham industry people in your area you should look around for ham fanatics to show and tell. Check out your members for any known DXers, packeteers, SSTVers, RTTYers, moonbouncers, meteor scatterers, microwavers, OSCARers, certificaters, contesters, builders, traffic handlers, and so on. Lift up the local rocks and see what crawls out.

I've seen some great DXpedition slides, and heard interesting talks on just about every ham fetish. They're out there if you'll beat the bushes. And don't dump the problem on the program chairman...get the whole club to scrounge.

Can you get some Novices and Techs to come to the meeting a half hour early for a short technical talk and perhaps ten minutes of code practice? This is a good way to help newcomers get licensed—and club members move up the ladder more easily. The club has to be fun...but it should also be supportive of the members. The club is where you provide the peer pressure to get 'em to get a higher class ticket. It's where you get more and more members to try new aspects of the hobby.

Keep 'em Short

Now, after the speaker and the Q&A... and then after the feeding frenzy...it's time for some reports. Short reports. This is the time for the TVI committee to report on its activities...the licensing committee on new and upgraded licenses...the school radio club Elmering committee...the self-policing committee on recent complaints... the program committee on upcoming entertainment...news of club activities such as an auction, flea market, picnic, mountaintopping party, Field Day effort, and so on. How about organizing groups to drive in a caravan to major hamfests and conventions?

At least one club member must have a Macintosh by now. Quickly elect him editor of the club newsletter. Help him set up the reports he's going to need and the deadlines for the reports. You want to build interest in ham activities so get in reports on packet action, DXing scores, contest scores, antenna erecting parties, OSCAR contacts, and so on.

Does anyone in your club have a video camera? Great! Get him to do a video of the club activities. Get him to visit members and make a video of their stations. If the club has some fox hunts you can make a fun video of the hunters. If you don't have fox hunts, why not? A short video will brighten up a meeting. If you don't have someone with a video and another member with a Macintosh in your club, you're badly in need of some new blood.

Growth Mode

How can you get new members? Easy... the club newsletter is a good sales tool. Get someone with a computer to make a list of every ham in the *Callbook* in your zip code areas and start sending them the newsletter for perhaps four issues with an invitation to come to the next meeting. You might even tell them what fun they will have when they come. Remember, as I said, you're in show business now. Once you get them to their first meeting, be sure you have a committee to spot them and make a fuss over them. Introduce them during the meeting. Make them special and they'll be back.

You can't afford to send free newsletters to a zillion inactive hams, so rotate the free copies as you can afford. It wouldn't hurt to have club members take lists of the potential members and give them a call with a personal invitation to come to a meeting.

At meetings you can ask members to make a list of every ham they hear in the area who should be invited. This will help you pick up many which aren't listed in the *Callbook* yet. It'll give you a first-class mailing list, too. These chaps are active hams, so they'll probably be an easier sell than someone who hasn't turned on a rig in ten years. Make sure club members talk up the club on the air and invite everyone they talk with on the air to the next meeting.

Be sure to put a small poster in any local ham dealer store. You'll want to have posters in the local high schools, too. Your newspapers will list your meetings, complete with a short story on your speaker. Cut out a copy for the speaker and give it to him. It'll help his ego.

Does your neighborhood have any bulletin boards? Get your posters up there, too. How do you make posters? Get that kid with the Macintosh, he'll be happy to oblige.

Have you thought about organizing some club outings? You might get a group together to visit a TV station...an observatory...an electronics plant...an FAA station...a research lab. You'll probably find at least one member with an in for such a visit.

Now Get Going

Okay, I've primed the pump...now I expect you to take the ball. If you have any ideas on how to get clubs perking, send them in so I can pass your ideas along...and give your club some credit.

Oops, I almost forgot. If I'm speaking at a club I ask for no smoking...and generally get a round of applause for it. Why not ask your nicotine addicts to indulge in their drug habit outside? Nicotine is a poisonous oily substance gotten from tobacco leaves... named after Nicot, a French diplomat who introduced the drug to France.

I've run into a few clubs who encourage the use of alcohol, passing around cans of cold beer. Another drug with millions of addicts. Let's keep drugs out of club meetings... alcohol, nicotine, pot, and cocaine. Why do kids think it is so cool to be drug addicts? Phooey...none of these drugs are going to improve your meetings.

I'm going to get working on some videos of my talks which might help fill in a few minutes for your meetings. I'll let you know as I get 'em ready. I've got a couple of the new 8mm cameras, so it won't be difficult. I'll do 'em on 8mm and then dub them to VHS for you.

If your club can put together an interesting video you might let other clubs know you have it available via *73*. I've seen some remarkable home movies of club activities in the past...now it's time to do these with video so we can inexpensively distribute them. What can your club do which will make an interesting video for other clubs and for showing at hamfests?■

- AIR CONDITIONED - ALL INDOORS - AIR CONDITIONED -

——Atlanta HamFestival——

WORLD CONGRESS CENTER–ATLANTA GEORGIA

SATURDAY, JULY 19TH & SUNDAY, JULY 20TH

ARRL

ATLANTA-RADIO-CLUB
W4DOC
AMATEUR-RADIO-FOR-INTERNATIONAL-FRIENDSHIP

ARRL

- Location-Georgia World Congress Center
- Indoor Airconditioned FleaMarket
- License Exams Given Both Days
- Plenty of Parking Nearby

- Admission-$6 Advance-$7 at the Door
(All Admissions Valid Both Days of HamFestival)
- Reservations Encouraged & Accepted
- Make Checks Payable to: Atlanta HamFestival

FOR INFORMATION WRITE:
ATLANTA HAMFESTIVAL–P.O. BOX 77171–ATLANTA, GA. 30357

- AIR CONDITIONED - ALL INDOORS - AIR CONDITIONED -

Dallas Williams WA0MRG
PO Box 1
Sedgwick CO 80749

Roll A RTTY Scope

An oscilloscope is still the best way to lock on to a teletype signal. Building one is easier than you think!

One of the most common complaints voiced by newcomers to radioteletype is difficulty in tuning the signal. It doesn't take long to realize that watching a couple of flashing lights and tuning for "good" copy is, at best, a haphazard method.

Over the years a number of schemes have been introduced to aid the tuning process, including dancing meter needles, LED bar displays, and various forms of digital and analog converters. Compared to the old reliable oscilloscope, however, they seem to leave a lot to be desired. The scope can tell the accuracy of the received shift. It will also give a very accurate indication of the tuning. For those of us who prowl the commercial RTTY channels, the scope is invaluable. It will, for instance, show at a glance the difference between a 375- and a 425-Hz-shift signal. In spite of the simplicity and accuracy of the oscilloscope, it is amazing how many RTTY operators have never used one.

Of course, it must be said that the oscilloscope will not work with all RTTY demodulators. Demodulators or terminal units (TUs) that do not have separate mark and space channel filters cannot use a scope for tuning purposes (at least not in the form described here). How can you tell? Look for output connectors labeled "oscilloscope" or, failing that, look at the schematic diagram. Nearly all demodulators that have separate mark and space channels or filters will be similar to the block diagram in Fig. 1. Older units may

Photo A. Left to right: surplus CRT shield and mounting bezel, 2-inch CRT, 3-inch CRT.

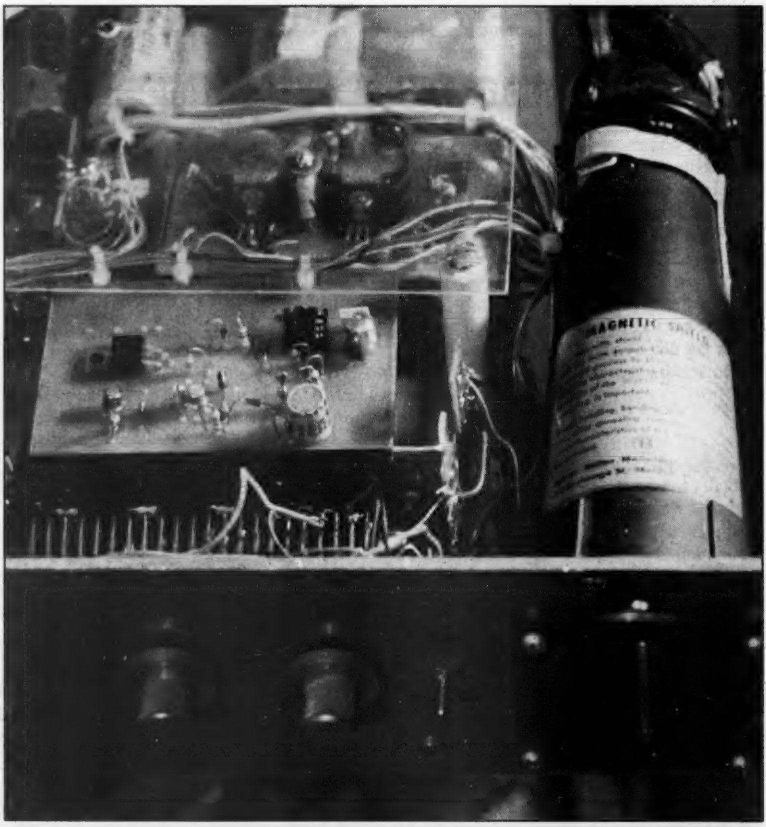


Photo B. The RTTY scope mounted in a home-brew TU.

SUMMER IDEAS

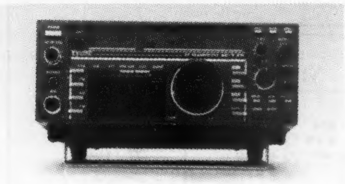
New rigs and old favorites, plus the best essential accessories for the amateur.

3621 FANNIN ST.
HOUSTON, TX 77004-3913
CALL FOR ORDERS
1-713-520-7300 OR
1-713-520-0550

ALL ITEMS ARE GUARANTEED OR SALES PRICE REFUNDED

EQUIPMENT

Kenwood	Call for prices on all Kenwood
Kenwood TS940S, contester's delight	Call
Kenwood TS 440	Call for trade
Icom R7000 25-2000 MHz	849.00
Icom IC3200	489.95
Santec ST20T Handi Talkie	289.00
Icom IC735	799.00
Ten-Tec 2510 (Easy OSCAR)	489.00



ACCESSORIES

B&W VIEWSTAR ANTENNA TUNER	89.95
Heil HC3/HC4/HC5	Stock
Heil BM10 Boom Mike headset	59.95
CSI Private Patch III	469.95
FLUKE 77 auto-ranging digital multimeter	125.00
Daiwa CN620B, 20-200, 2000W	109.95
Alinco ELH 230D- Excellent buy	79.00
Nye MB5-A (for the big boys!)	529.00
Shure 444D	54.95
Wahl 7470 Soldering Station	49.00
Kenwood IF 10A, B, C,	Stock
Kenwood IF 232C Level translator	49.00
Miller C514T Low pass filter	43.50
B & K Test Equipment VOM, oscilliscopes, generators, etc	CALL

ANTENNAS

Isopole 144 MHz	44.95
A4	269.00
402CD	279.95
424B	84.00
215WB New, 15 El, 2M beam	79.95
AOP-1, Complete Oscar Antenna	149.95
Butternut HF6V, 80-10 vertical	125.00
HF2V, 80 & 40 vertical	119.00
HF4B	189.00
Hustler G7-144	119.95
Hustler 6BTV	139.00
Ham4 Rotator, T2X, CD45-2	Call
KLM HF World Class Series Antennas	Call Don
Alpha Delta Twin Sloper	49.00
Coax Seal	2.00/roll
B&W Dipoles	Less 10%
Hy-Gain TH7DXS	489.00
Explorer 14	349.00
Discoverer 1 element 40M	169.00
2 element 40M	369.00
3 element only	249.00
CD 45-2 Great Tribander Rotor	169.00
V2S (2meter)	59.00
HG52SS 52 ft. crankup tower	1199.00
Prepaid freight when you order other Hy-Gain items with tower	
KLM KT-34A	339.00
40M-2	299.00
New Telex/HyGain 2-18s Complete HD OSCAR system ..... List 365.00	Your Cost 269.00

OTHER ANTENNAS

Larsen Kulduck	17.00
Larsen 440 HW 1/2 wave Kulduck	25.00
Avanti AP151.3G on Glass Antenna	36.00
Anteco 2M, 5/8, Mag. Mount, Comp	25.00
Avanti APR450-5G on glass	39.00
Orion 2M 1/2 wave handy Antenna	19.00
Van Gordon SLA-1 160-80-40 Sloper	34.00
Valor AB-5 Mobile	79.95
Stoner DA100 D Active Rx Antenna	190.00
DC 'Tenna Hitch 3/8-24 Thread Fits 3/4″-1″ trailer hitches	29.95

"NEW"
ALPHA DELTA 4
HEAVY DUTY COAX SWITCH

with ground pos. & lightning protection	69.00
Collins KWM2/S line xtals	10.00 each

ICOM

751A ....List 1499.00 ....Your Cost 1299.00

KEYS

Bencher & Vibroplex	Less 10%
Bencher is now improved. Screws & springs, all stainless steel and extra hand polishing.	
Trade in your old hand key on new Vibroplex/Bencher	5.00
Nye ESK-001 Keyer	58.00

TUBES

Collins & Drake Replacement tubes	stock
GE 6146B	11.95
Eimac 3-500Z	109.95
GE Industrial Tubes	Call
GE 12BY7A	7.00
GE 6JS6C	12.95
Cetron 572B	69.00
GE 8950	14.00

BOOKS

We stock SAMS, TAB, ARRL, RSGB, Ameco Radio Pubs	Call

PASSED Your code yet? Try Gorden West's Code Tapes.

Philmore Field Strength/SWR Meter 3-150MHz, KW +	19.95

SURPLUS

24 Pin Soldertail dip sockets	25/each
150MFD/400V DC	1.95
1.5 Amp/400V full wave bridge rectifier	1.95
2.5A/1000PIV Epoxy diode	29 each or 19.00/100
.0015/10KV or .001/20KV	1.95 each
3N201	.95
4 inch ferrite rod	1.95
365pF cap	1.95
Sanyo AAA,AA Nicads w/tabs	2.00
2,4,5,6,8 pin mic plugs	3.00
1/8, 1/4, watt carbon resistors	.05 each
Meters 0-3000 VDC 2½″ Square 0-1 Amp DC	9.95
Drake—Collins mike plug	2.00
Miniature toggles, 5A/125VAC	1.50 each
Close out on rigs & accessories. All the time	Call

We may have what you're looking for.

BELDEN

9913 low loss, solid center, foil/braid shield	51c/ft.
8214 RG8 Foam	45c/ft.
8237 RG8	39c/ft.
8267 RG213	55c/ft.
8000 14 Ga stranded copper ant. wire	13c/ft.
8448 8 conductor rotor cable	33c/ft.
9405 Heavy duty 2-16 Ga 6-18 Ga	56c/ft.
9258 RG8x	20c/ft.
9269 RG-62A/U	16c/ft.
8403 Mic Cable, 3 condctr & shield	45c/ft.
100 feet 8214 w/ends installed	54.00
8669 7/16″ tinned copper braid	1.00/ft.
International Wire RG214, non-mil. good cable	70c/ft.
International Wire 9086 exact replacement for Belden 9913	36c/ft.
International 16 Ga stranded antenna wire	6c/ft.
International 4063 RG-213	28c/ft.

AMPHENOL

831SP-PL259 Silverplate	1.25
UG176 reducer RG8X	.30
831J Double Female UHF	2.00
82-61 N Male	3.00
82-97 N Female Bulkhead	3.00
82-63 Inline Female N	4.00
82-98 N elbow	9.00
31-212 BNC-RG59	1.50
31-2 BNC-RG58	1.50
34025 N Male, RG58	3.00
34125 N Female-UHF male	9.00
3128 BNC Female-PC259	3.00

TOWER ACCESSORIES

1/4″ E.H.S. Guy cable, Rohn US, 1000 ft.	250.00
3/16″ E.H.S. cable, Rohn US, 1000 ft.	210.00
1/4″ Guy Cable, 6100 #7 x 7 strand, import	15c/ft.
3/16″ Guy Cable, 3700 #7 x 7 strand, import	12c/ft.
3/8 x 6 E&J Turnbuckle	7.95
3/16″ Wire Rope Clips	.40
1/4″ wire clips	.50
1/4 Thimbles	.45
Porcelain 500D Guy Insulator (3/16)	1.99
Porcelain 502 Guy insulators (1/4)	3.39

COMPUTER STUFF

Kantronics UTU-XT	319.00
Fits any computer (even yours!)	
Morse University (Great CW program for C-64)	39.00

PACKET POWER

AEA PK-64, does RTTY,ASCII,AMTOR also	199.00
AEA PK-80 TAPR II	199.00
NEW Kantronics Packet II	199.00
MFJ 1270	115.00
AEA PM-1	149.00

SERVICES

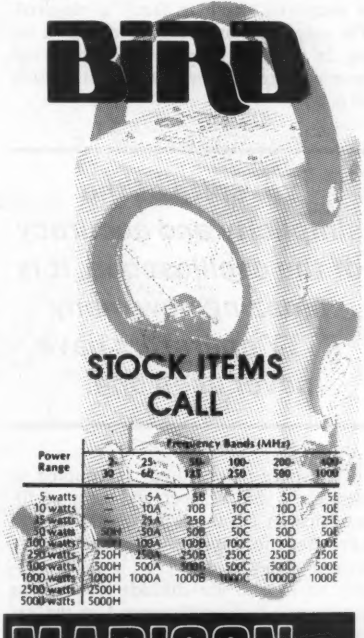
Alignment, any late model rig	50.00
Flat fee Collins rebuild	Call

USED EQUIPMENT

All equipment, used, clean, with 90 day warranty and 30 day trial. Six months full trade against new equipment. Sale price refunded if not satisfied.

POLICIES

Minimum order $10.00. Mastercard, VISA, or C.O.D. All prices FOB Houston, except as noted. Prices subject to change without notice. Items subject to prior sale. Call anytime to check the status of your order. Texas residents add sales tax. All items full factory warranty plus Madison warranty.



STOCK ITEMS
CALL

Power Range	Frequency Bands (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
5 watts	—	5A	5B	5C	5D	5E
10 watts	—	10A	10B	10C	10D	10E
25 watts	—	25A	25B	25C	25D	25E
50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
1000 watts	1000H	1000A	1000B	1000C	1000D	1000E
2500 watts	2500H					
5000 watts	5000H					

MADISON
Electronics Supply

3621 FANNIN
HOUSTON TEXAS 77004

1-713-520-7300 OR 1-713-520-0550

25

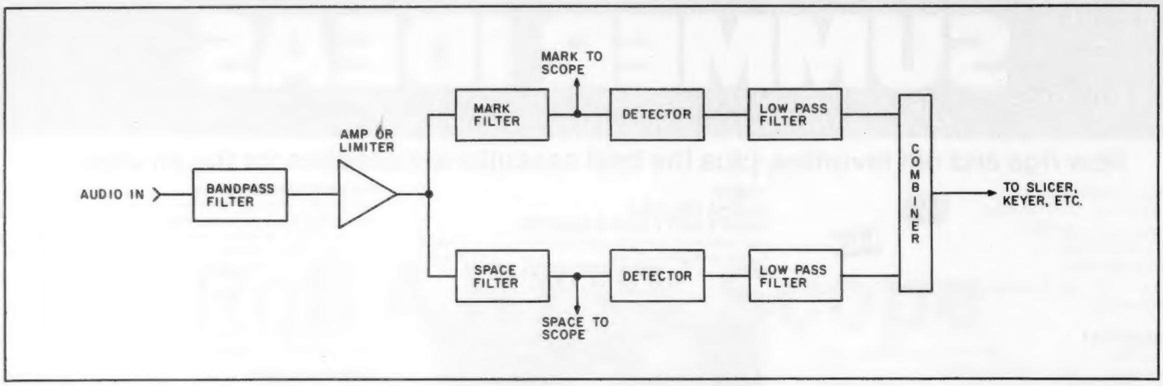

MARK TO SCOPE
AMP OR LIMITER
AUDIO IN
BANDPASS FILTER
MARK FILTER
DETECTOR
LOW PASS FILTER
COMBINER
TO SLICER, KEYER, ETC.
SPACE FILTER
DETECTOR
LOW PASS FILTER
SPACE TO SCOPE

Fig. 1. Block diagram of the audio stages of a typical RTTY demodulator.

have toroidal coils and capacitors for the filters rather than operational amplifiers or switched capacitors, as is the current trend. In either case, the important thing is separate filters for mark and space. Some demodulators will have more than one space filter, the other filters being switched in when tuning different shifts.

Adding a Scope

Assuming that your TU can use a scope, there are two ways to go. The easiest is to hook up a standard oscilloscope. They can usually be found for $5 and up at swapfests. Nothing fancy is required. The only important thing (other than it being in working order) is that the scope have an external horizontal input. Nearly all do.

> ***"In spite of the simplicity and accuracy of the oscilloscope, it is amazing how many RTTY operators have never used one."***

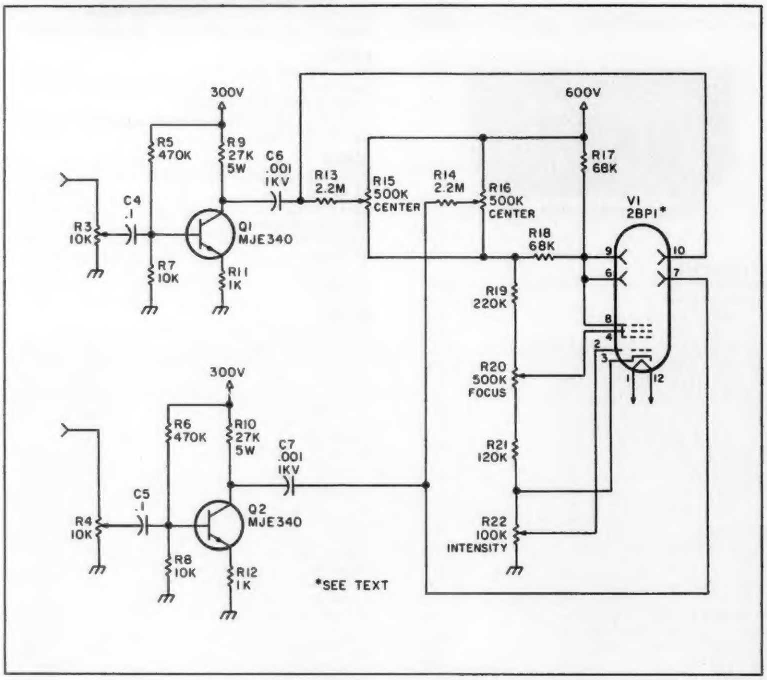

300V
R5 470K
R9 27K 5W
C6 .001 1KV
R13 2.2M
R15 500K CENTER
R14 2.2M
R16 500K CENTER
600V
R17 68K
V1 2BP1*
C4 .1
R3 10K
Q1 MJE340
R7 10K
R11 1K
R18 68K
9
10
6
7
R19 220K
8
4
2
3
R20 500K FOCUS
1
12
300V
R6 470K
R10 27K 5W
C7 .001 1KV
C5 .1
R4 10K
Q2 MJE340
R8 10K
R12 1K
R21 120K
R22 100K INTENSITY
*SEE TEXT

Fig. 2. RTTY tuning scope.

The space-filter output is coupled to the scope's vertical input, and the mark-filter output is fed to the horizontal input. I have had no trouble doing this using plain hookup wire. However, it would probably be wise to use shielded cable. Place the scope's horizontal control in the external position. If the TU has a limiter, turn it on.

With the scope and demodulator turned on, adjust the scope controls until a dot appears in the center of the scope tube. Now feed a mark signal into the demodulator. You should see a horizontal line on the scope tube. If not, then adjust the horizontal gain until a line appears across the face of the tube. Many scopes are a bit short on horizontal gain, and you might find that the trace will not cover the entire face of the tube.

Next, feed a space signal into the TU. A vertical line should now appear on the scope. Adjust the vertical gain until the line is the same length as the mark display.

That's all there is to it. When tuning in a RTTY signal, the lines on the scope will assume a more oval shape due to the mark and space filters. The narrower the oval is, the narrower the filters being used (assuming no change in shift).

Roll Your Own

The second way of adding a scope to your RTTY setup is to build your own. It is neither difficult nor costly. Your own scope will have the advantage of being smaller than a regular oscilloscope, which means it can be built inside a present TU.

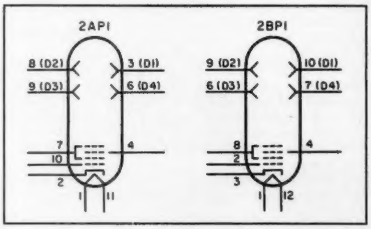

2AP1
8 (D2)
9 (D3)
3 (D1)
6 (D4)
7
10
4
2
1
11
2BP1
9 (D2)
6 (D3)
10 (D1)
7 (D4)
8
2
4
3
1
12

Fig. 3. CRT basing diagrams.

A basic RTTY scope consists of the CRT (see Photo A), centering controls, horizontal amplifier, vertical amplifier, and power supply. The actual scope circuit (see Fig. 2) has

HAM PACKAGE (APL) DISK	$2.59 !!!
TRS 80 ENCYCLOPEDIAS	CALL !!!

CALL

1-800-843-6700

TRS-80 C/64 VIC-20 IBM

HOWARD SAMS COMPUTER FACTS. CALL FOR COMPLETE LIST OF COMPUTER REPAIR GUIDES

SUPER SAVER! ANCHOR MODEMS

LIGHTNING 24	$429.00
EXPRESS	$360.00
EXPRESS I	$199.00
VOLKS MINI	CALL
VOLKSMODEM	$89.00
VOLKSMODEM 12	$189.00
MARK X	$110.00
VOLKS 6420	$80.00

300/1200/2400 BAUD MODEMS. ONE YEAR WARRANTY!

CALL FOR SPEC'S. WE'LL FIT YOU WITH THE RIGHT MODEM FOR YOUR NEEDS!

COMPLETE ACCESSORIES LINE TOO!!!

BLACK JACK MODEMS 35.00

COMMUNICATIONS

Computer Supplies of Peterborough

CSP

SOFTWARE HARDWARE ACCESSORIES SUPPLIES

LOOK

FREE! CASSETTE CARRY CASE WITH EACH $20.00 ORDER! WHILE THEY LAST

SOFTWARE
GRAPHTIX
SUPERCALC
ACCTS PAYABLE
FILEVISION PFS PLAN
GRAPHS & SOUNDS
PEACHPAK
ROUTINE MACHINE
FLASHPAK
VISITREND
PFS REPORT
SAMPLER I
DATA DESIGN
ARCHON
FLIGHT SIMULATOR
MICROPLAN
LEARNING LAB
ASTROLOGY
MOUNTAIN PILOT

SUSPENDED
SEVEN CITIES
CROSS FIRE
MURDER ON ZINOIN DORF
TRIVIA FEVER

BROTHER PRINTERS

HR 15XL	
HR 25	$519.00
HR 10	$255.00
2024 L	$700.00

COMPARE PRINTER PRICES AND SAVE

FULL LINE OF BROTHER ACCESSORIES AND RIBBONS

FULL LINE OF PRINTER RIBBONS IN STOCK $ PRICES START AT $2.80!!!

ASTROLOGY
MICRO TERM
TYPING TEACH

WORDWATCH

ARE YOU DISKORGANIZED??

TEAKWOOD DISK HOLDERS!!!!!!!

3.5" HOLDS 45	$16.95
3.5" HOLDS 90	$28.50
5.25" HOLDS 50	$24.85
5.25" HOLDS 100	$32.45
5.25" HOLDS 110 (DOUBLE WIDE)	$34.20

TEAK HOLDERS FIT CD'S TOO !!

LOOK

FREE GLARE SCREEN WITH EACH MONITOR!! COLOR MONITORS

HIRES COMPOSITE (GREEN) (AMBER)	$79.00
14" COMPOSITE COLOR TV GRADE	$189.00
RGB DATA GRADE/COMPOSITE	$289.00
12" TTL GREEN	$169.00

GOLD DISK	$12.95
SALE EDGE	$29.95
MIND PROBER	$29.95
DBASE II	$99.00
R BASE 4000	$290.00

DRAGONQUEST
FLYING CIRCUS
MASTER REVERSE

MICRO TERM

SUPERCALC	$150.00
WORD HANDLER	$55.00
WORD VISION	$55.00

PICO PRODUCTS

HALF HEIGHT DRIVE $159.00!!

TILT AND SWIVEL POWER BASE $49.95!!

SURGE PROTECTORS!!

CURTIS: DIAMOND
EMERALD
SAPPHIRE
RUBY
SAFE STRIP

3/4/6 OUTLET STRIPS SWITCHED/UNSWITCHED

CALL 800-843-6700

APPLE CLINIC
GHOSTOWN
WORDWATCH
SKY BOMBERS
JET FIGHTER

BOARDS! BOARDS! BOARDS!

ADD-ON CARDS

PARALLEL INTERFACE	$39.20
DUAL GAME PORT	$29.60
RS 232	$37.80
MULTI I/O	$129.00
384K MULTIFUNCTION	$149.00

CARDS FOR PC/AC/XT & COMPATIBLES DON'T SEE IT??? CALL & WE WILL TRY TO GET IT!

CABLES PARALLEL & SERIAL 6 FT SHIELDED ONLY $12.00

AIRMAIL PILOT
PHASERBLAST
STARTREK

STORYBUILDER
PLATO SPANISH
SQUARE PAIRS TURTLETRACKS
TYPING TUTOR WORDMASTER

=PRINTER SWITCH BOXES=

PARALLEL A-B TRANSFER	$59.95
PARALLEL 6 FT CABLE	$19.50
SERIAL A-B TRANSFER	$59.95

ALL LEADS SWITCHED

DISKETTES BEST PRICES! CALL CALL CALL ....

1-800-843-6700

JAZZ	$350.00
PRINT SHOP	$17.00

BEEN SEARCHING?? FOR THE IMPOSSIBLE TO FIND PRODUCT?? GIVE US A CHANCE TO HELP!!!!!

WGE CENTER
PETERBOROUGH, N.H.
03458 CALL ....
1-800-843-6700

BOB'S BARGAIN SOFTWARE
C64/VIC 20/TRS-80 SOFTWARE
FROM $1.99, CALL 1-800-843-6700

ALLOW 2–4 WEEKS FOR DELIVERY. CALL NOW. QUANTITIES LIMITED IF ITEMS ARE SOLD OUT WE RESEHVE THE RIGHT TO SUBSTITUTE.

M/C VISA CHECK MONEY ORDER

100

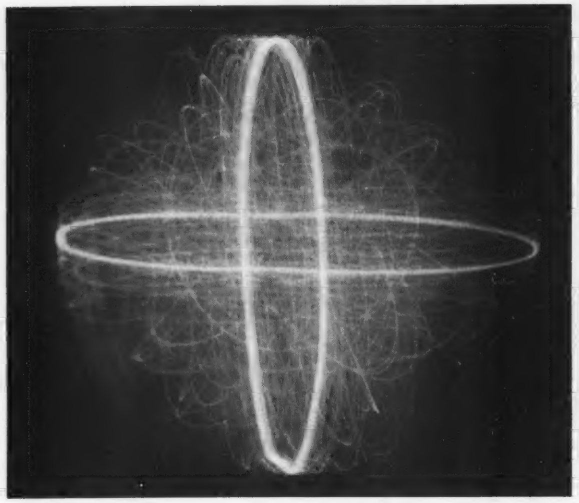


Photo C. A 170-Hz-shift RTTY signal, as displayed by a scope. Compare this with Photo D.

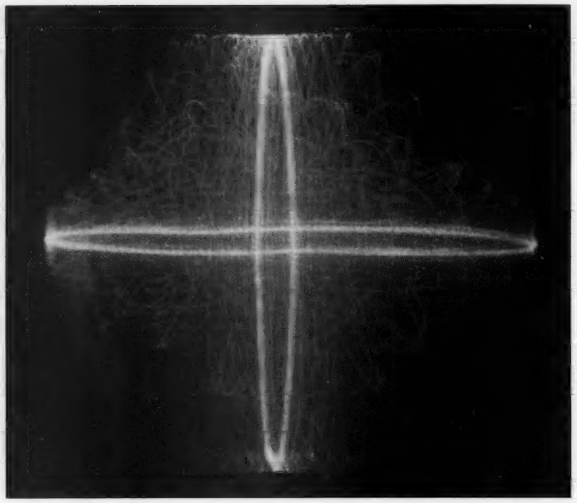


Photo D. A 425-Hz-shift signal. The filters used have the same bandwidth and gain as those used.

been around for years and is a standard with old-time RTTY fans.

Amplifiers Q1 and Q2 are required because the output of the demodulator filters is not great enough to give adequate CRT spot deflection. With the power-supply voltages given, the two one-transistor amplifiers used in the circuit have more than enough gain for full deflection when driven with op-amp-type filters having outputs greater than about 3 volts peak-to-peak.

Because the scope input impedance is somewhat low, it could cause undue loading of the filter and detector circuits of some demodulators. This could be overcome by adding a high-impedance voltage-follower stage to drive each amplifier.

A word of caution: The voltages in this circuit are dangerous and a simple accident could be fatal. *Use extreme care.*

Parts

The CRT shown is a 2BP1, but a 2AP1 will work just as well—though it has different pinouts and requires a different socket. Fig. 3 shows the basing diagrams for the 2BP1 and 2AP1.

The 2B-- series CRT was manufactured with several phosphor types, including P1 and P11. The P1 phosphor in the 2BP1 is the common green. The rarer P11 (2BP11) yields a blue trace. There is no other difference between the two CRTs.

The CRT you use will most likely be determined by availability. Small CRTs are sometimes hard to locate. If you happen to locate a 1-inch tube, then use it. Some 3-inch tubes can be used, but they are longer and take up far more space than is really necessary.

Finding the necessary components will probably be the most difficult part of building the scope. In this day of solid-state and microcircuits, higher voltage and power components are expensive and sometimes hard to locate. A quick check showed the 2BP1 priced from $10 to $75 in "used" condition; so if you buy the parts, careful shopping is advised. Many times you can locate a surplus scope foundation for a price that is less than the cost of the CRT alone. Some used CRTs may show trace burns, but unless the burns are serious the tube is probably still usable.

While a mu-metal shield for the CRT is not absolutely necessary, it will protect the scope display from being distorted by stray magnetic fields associated with the power transformers. The shield also simplifies the mounting of the tube. A surplus scope foundation will have not only the tube and shield but also the socket and usually a mounting bezel. These can be removed and placed in a new box or panel, making an attractive display.

An alternative would be to make a bezel from a circular meter by removing the meter movement and the back of the case. Replace the meter glass with green plastic. A separate shield can be purchased from a surplus dealer.

Care should be exercised when inserting the CRT in the socket. Many of these older tubes suffer from poor bonding between the glass envelope and the Bakelite™ base. One wrong twist or push could ruin the tube.

The collector load resistors in the vertical and horizontal amplifiers should be 5-Watt units. They do get warm and should be mounted in a reasonably open space.

Since the scope draws so little current, only half-wave rectification is used in the power supply (see Fig. 4). Transformer T1 secondary voltage is not very critical and just about anything between 150 and 250 volts each side of center tap will work. The low-voltage output from the power supply should not be greater than 300 volts, otherwise the

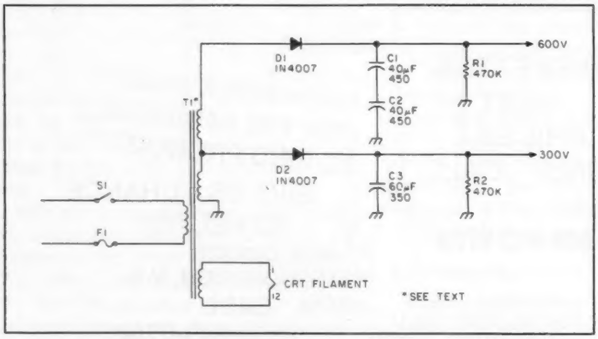


Fig. 4. Power supply.

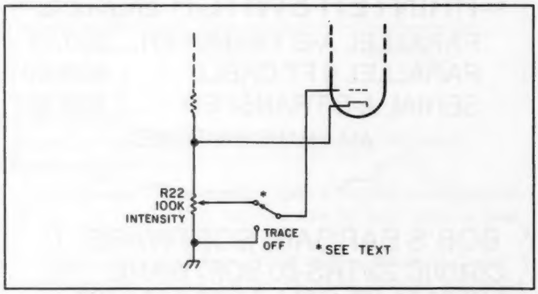


Fig. 5. Optional circuit to turn off scope trace

Place
Stamp
Here

73 Amateur Radio

WGE CENTER
70 RTE. 202 NORTH
PETERBOROUGH, NH 03458-9995

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 33 PETERBOROUGH, NH

POSTAGE WILL BE PAID BY ADDRESSEE

73 Amateur Radio

WGE CENTER
70 RTE. 202 NORTH
PETERBOROUGH, NH 03458-9995

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

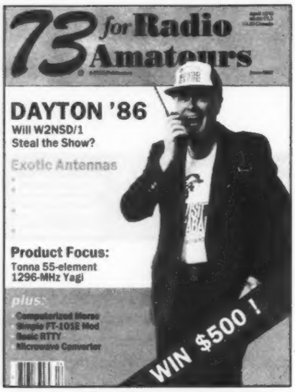
FIRST CLASS MAIL PERMIT NO. 33 PETERBOROUGH, NH

POSTAGE WILL BE PAID BY ADDRESSEE

73 Amateur Radio

WGE CENTER
70 RTE. 202 NORTH
PETERBOROUGH, NH 03458-9995

☐YES, I'm with you for more ham gear reviews and the growth of amateur radio.


73 for Radio Amateurs
DAYTON '86
Will W2NSD/1 Steal the Show?
Exotic Antennas
Product Focus:
Tonna 55-element 1296-MHz Yagi
plus:
Computerized Morse
Simple FT-101E Mod
Basic RTTY
Microwave Converter
WIN $500 !

Send me 12 issues of *73* for the low subscription price of $19.97.

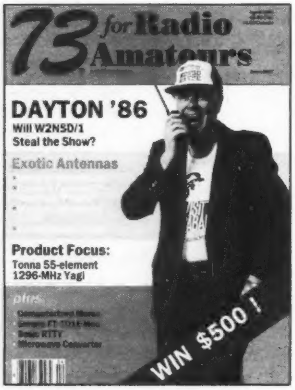
NAME______________________ CALL____________
ADDRESS____________________________________
CITY______________ STATE______ ZIP__________

☐AE ☐MC ☐VISA ☐CHECK ENCLOSED
Card#__________________ Exp. Date__________

Canada/Mexico—$27.97, 1 year only.
Foreign Surface—$44.97, 1 year only.
US funds drawn on US bank.
Please allow 6–8 weeks for delivery since we're computerized for speed.

Your *73* subscription is urgently needed—please. **3676A**

☐YES, I'm with you for more ham gear reviews and the growth of amateur radio.


73 for Radio Amateurs
DAYTON '86
Will W2NSD/1 Steal the Show?
Exotic Antennas
Product Focus:
Tonna 55-element 1296-MHz Yagi
plus:
Computerized Morse
Simple FT-101E Mod
Basic RTTY
Microwave Converter
WIN $500 !

Send me 12 issues of *73* for the low subscription price of $19.97.

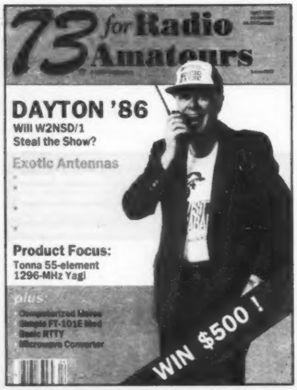
NAME______________________ CALL____________
ADDRESS____________________________________
CITY______________ STATE______ ZIP__________

☐AE ☐MC ☐VISA ☐CHECK ENCLOSED
Card#__________________ Exp. Date__________

Canada/Mexico—$27.97, 1 year only.
Foreign Surface—$44.97, 1 year only.
US funds drawn on US bank.
Please allow 6–8 weeks for delivery since we're computerized for speed.

Your *73* subscription is urgently needed—please. **3676A**

☐YES, I'm with you for more ham gear reviews and the growth of amateur radio.


73 for Radio Amateurs
DAYTON '86
Will W2NSD/1 Steal the Show?
Exotic Antennas
Product Focus:
Tonna 55-element 1296-MHz Yagi
plus:
Computerized Morse
Simple FT-101E Mod
Basic RTTY
Microwave Converter
WIN $500 !

Send me 12 issues of *73* for the low subscription price of $19.97.

NAME______________________ CALL____________
ADDRESS____________________________________
CITY______________ STATE______ ZIP__________

☐AE ☐MC ☐VISA ☐CHECK ENCLOSED
Card#__________________ Exp. Date__________

Canada/Mexico—$27.97, 1 year only.
Foreign Surface—$44.97, 1 year only.
US funds drawn on US bank.
Please allow 6–8 weeks for delivery since we're computerized for speed.

Your *73* subscription is urgently needed—please. **3676A**

I'M BACK!...WAYNE W2NSD/1

Here are ten reasons why you're going to be all upset with yourself if you don't subscribe to *73*—Now!

1.) If we're going to get amateur radio growing again I'm going to need your help. I can do it, but not alone.

2.) You're going to enjoy the new life in *73*—articles on how and why you can get involved with packet radio, OSCAR, traffic handling, DXing, cross-band repeaters, RTTY, slow-scan, and so on.

3.) You won't want to miss *73*'s bargain DXpeditions—starting with Asia this October— going to Sarawak 9M8 Brunei V85 and Sabah 9M6.

4.) Will I be able to get 800,000 new hams licensed *per year* in China? I think I can—and you will want to read how I'm going to do it. I'll even tell you how to get such a program going in the U.S. We sure could use it!

5.) Are you interested in *73* reader evaluations of ham gear? Now you can vote on your gear and read what the other *73* readers think of theirs.

6.) Want to find out just how bad an operator you are? Read the LID list in *73* and weep. Better yet, shape up!

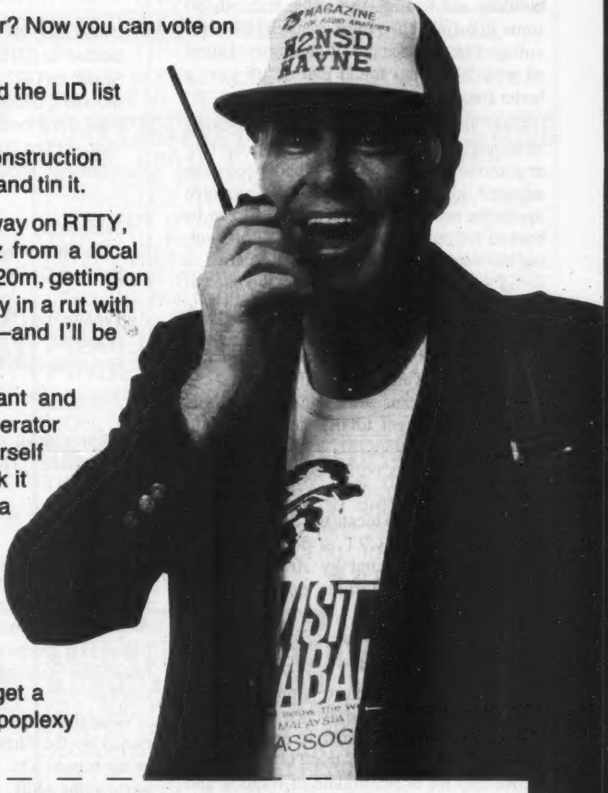
7.) How about building stuff? I'll be running all the simple construction projects I can get in *73*. Better get out your soldering pencil and tin it.

8.) I have a whale of a lot of fun building gadgets, typing away on RTTY, working high-speed CW, making DX contacts on 10 GHz from a local mountain (DX being a new state), working a new country on 20m, getting on the air from some very rare spot... stuff like that. Don't stay in a rut with your hamming, there are just too many fun things to do—and I'll be writing about 'em in *73*.

9.) I've forgotten what this was, but it was very important and persuasive. If I could remember it you'd call my 800 operator immediately with your subscription. You'll never forgive yourself if you miss out on this one... I remember that much! I think it had something to do with a whole lot of money—perhaps a free trip somewhere. Check *73* for the details.

10.) We're going to be reprinting some of the funniest ham humor from *73*'s sordid past. A medical checkup is recommended before reading.

11.) (bonus) Yes, I know *73* got pretty dull last year—well, well, I'm back and whatever *73* is, it won't be dull. Better get a refill on your Diazide so you won't be after me for giving you apoplexy when you read my editorials.



Call: 1-800-722-7790

Send in the coupon—or call my 800 operator and get started with *73*. It's only $19.97 a year, or three years for $50. (Three's obviously the best deal. Three years from now you'll wish you'd bought six.) You can send a check or your credit card info. Remember, procrastination is the thief of *73*, so do it now. Look, you've got my guarantee: Either you enjoy *73* or you can ask for your money back. Y'all write, y'hear?

Wayne Green W2NSD/1
Editor/Publisher—again

YES! Enter my subscription to *73* Magazine starting with the next issue.

Name____________________

Call____________________

Address____________________

City__________ State______ Zip______

☐Check ☐Amex. ☐MC ☐BA

#____________________

Expiration date:____________________

CALL: 1-800-722-7790

73 Magazine WGE Center Peterborough, NH 03458 USA

787801

ratings of the transistors may be exceeded. A transformer from an old tube-type radio will probably work fine. The one used here came from a defunct chart recorder. If the T1 chosen has a 6-volt filament winding, it can be used for the CRT (assuming the CRT has a 6-volt filament) rather than using a separate transformer. Both the 2AP1 and 2BP1 have filaments rated at 6.3 V at 0.6 A. (Don't overlook the possibility of tapping into the transceiver's high-voltage supply—if it has one.)

The value of the power-supply filter capacitors given in Fig. 4 is just about the minimum that can be used. More would be better. Be sure that the voltage rating is greater than the supply voltage. Some series-parallel combination will probably be necessary to achieve the needed values. If, after building and testing, the scope trace shows some ghosting, then an increase in the low-voltage filter capacitance is necessary. I started with 30 uF but found that 60 uF gave a better trace.

Only the intensity control needs to be mounted in a convenient place. Once the other controls are set, they should not need to be adjusted again; thus, they can be mounted inside the unit. The intensity control can be backed off during standby periods, preventing burning of the CRT. As an alternative, a DPST switch can be wired across the intensity control to turn off the trace during idle periods (see Fig. 5).

Nothing in the circuit is critical, so just about any layout and construction method can be used. The transistors should have heat sinks. Don't forget to use heat-sink compound and insulating kits. Remember, there are up to 300 volts on the collector of each transistor.

It is a good idea to locate the transformer as far away from the CRT as possible. If the CRT trace is distorted by stray magnetic fields from the transformer, try rotating the transformer slightly.

Tune-Up and Hookup

Tune-up is just as before, although at this point it makes little difference which amplifier is mark and which is space. After connecting the scope to the TU (Photo B), set R3 and R4 to the middle of rotation and adjust the scope controls for a fine spot in the center of the CRT. If the spot does not focus to a fine dot, then it is probably being distorted by stray magnetic fields from the power supply.

Now feed a mark signal into the TU. A line should appear on the CRT. The line will probably not be horizontal but rather at an angle. Loosen the CRT mount and carefully rotate the scope tube until the line is horizontal. Adjust the associated gain control until the line crosses the entire CRT face when the input signal is maximum. Any further increase in the input signal should not cause the CRT display to expand.

Using a space signal, adjust the remaining gain control in the same fashion for a vertical trace. The RTTY scope is ready to use.

The Display

Over the years, numerous drawings and an occasional photograph have been published showing the patterns displayed by a RTTY scope. Unfortunately, many of these are based on a "perfect" system; they sometimes have little resemblance to the traces seen in real life.

What the scope shows is, of course, determined by the filters in the TU and the shift being tuned. The wider the filters or more narrow the shift, the more oval the scope traces become (see Photos C and D). This is caused by lack of complete mark and space channel isolation.

The scope also will show a number of faint traces around the main ovals. These traces are caused by the mark-space frequency transitions of the received signal; the change from mark to space is not instantaneous. The narrower the filters or the higher the keying speed, the more pronounced these secondary traces become. Since minimum usable filter bandwidth is directly related to the keying speed, a point can be reached where the scope will not give an adequate display for tuning. But the TU could not handle the signal anyway.

Ideally, when a signal is properly tuned the ovals will form a perfect cross. However, if the shift being received is not quite accurate, then when the mark signal is properly tuned the space trace will not be perpendicular. Instead, it will be rotated clockwise if the shift is too narrow, or counterclockwise if it's too wide. (Some commercial scopes will show an opposite rotation.)

Also, some filters and limiters introduce phase shifting, making a perpendicular display nearly impossible to achieve. Another form of phase shift produces ovals that look more like figure eights. In my case, this latter form of phase shift is caused by over-driving the input of the TU and is easily cured by turning down the receiver audio.

If the phase shift is taken into consideration, the scope will still work quite well. Of course, phase shift can be corrected by the addition of a "phaser circuit," usually consisting of a resistor-capacitor combination in series with the scope input.

Monitoring your own signal and using the scope as a spotting indicator is a good way to make sure you are on the other station's frequency. With the use of MSO operation, this is very important.

After a few hours of using the RTTY scope, you will probably wonder how you ever got along without it. ■

Parts List

C1–C3	60 uF, 450 V, electrolytic (see text)	$6.00
C4–C5	.1 uF, disc ceramic (RS 272-135) (J)	.59
C6–C7	.001 uF, 1 kV, disc ceramic	.18
R1–R2	470k, 1/2-Watt resistors	.19
R3–R4	10k linear pots (RS 271-1715)	2.18
R5–R8	1/2-Watt resistors	.38
R9–R10	5-Watt resistors	1.00
R11–R14	1/2-Watt resistors	.38
R15–R16, R20	500k linear pots (RS 271-210)	3.27
R17–R19, R21	1/2-Watt resistors	.38
R22	100k linear pot (RS 271-092)	1.09
Q1–Q2	MJE 340 or equivalent	2.64
D1–D2	1 Amp, 1,000 V, 1N4007 or equivalent (J)	1.49
T1	Primary 110 V, Secondary 150–250 V c-t (F) (see text)	
S1	SPST miniature toggle switch (J)	1.49
S2	SPDT miniature toggle switch (J) (see text)	1.49
2-inch cathode ray tube (CRT) such as 2AP1 or 2BP1 (T, F) (see text)		
Socket for CRT (F) (see text)		
Shield for CRT (F) (see text)		
Mounting bezel for CRT (F) (see text)		
Heat sinks for Q1 and Q2 (RS 276-1363) (J)		1.58
Misc.—Fuse (1/4 A), fuse holder, line cord, terminal strips, hardware, cabinet, knobs, etc.		

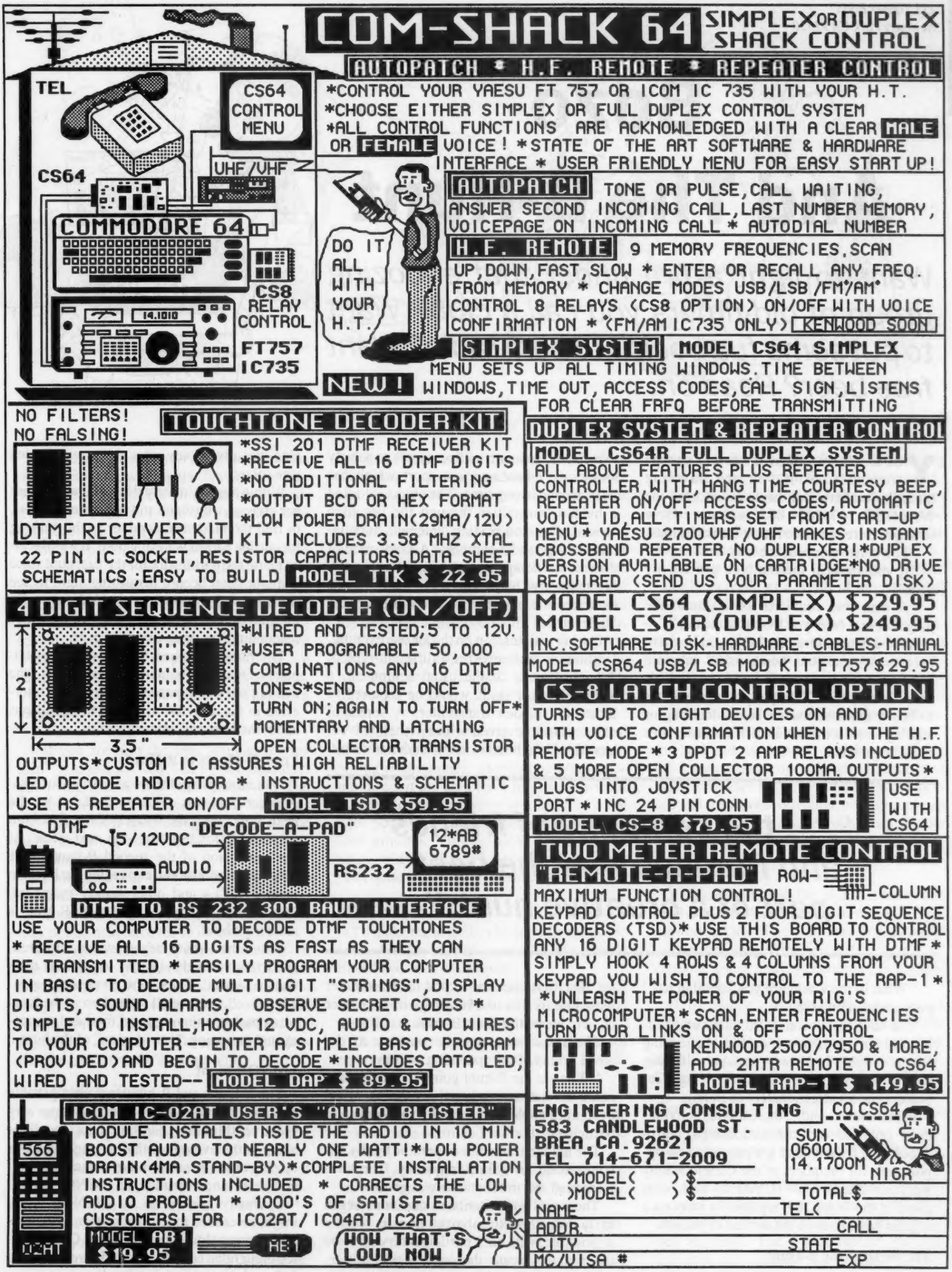
Possible Sources:

Jameco (J)
1355 Shoreway Road
Belmont CA 94002

Typetronics (T)
Box 8878
Ft. Lauderdale FL 33310

Radio Shack (RS)

Fair Radio Sales (F)
PO Box 1105
1016 E. Eureka Street
Lima OH 45802



COM-SHACK 64

SIMPLEX OR DUPLEX SHACK CONTROL

AUTOPATCH * H.F. REMOTE * REPEATER CONTROL

*CONTROL YOUR YAESU FT 757 OR ICOM IC 735 WITH YOUR H.T.
*CHOOSE EITHER SIMPLEX OR FULL DUPLEX CONTROL SYSTEM
*ALL CONTROL FUNCTIONS ARE ACKNOWLEDGED WITH A CLEAR MALE OR FEMALE VOICE! *STATE OF THE ART SOFTWARE & HARDWARE INTERFACE * USER FRIENDLY MENU FOR EASY START UP!

AUTOPATCH TONE OR PULSE, CALL WAITING, ANSWER SECOND INCOMING CALL, LAST NUMBER MEMORY, VOICEPAGE ON INCOMING CALL * AUTODIAL NUMBER

H.F. REMOTE 9 MEMORY FREQUENCIES, SCAN UP, DOWN, FAST, SLOW * ENTER OR RECALL ANY FREQ. FROM MEMORY * CHANGE MODES USB/LSB /FM*AM* CONTROL 8 RELAYS (CS8 OPTION) ON/OFF WITH VOICE CONFIRMATION * *(FM/AM IC735 ONLY) KENWOOD SOON

NEW! **SIMPLEX SYSTEM** **MODEL CS64 SIMPLEX** MENU SETS UP ALL TIMING WINDOWS, TIME BETWEEN WINDOWS, TIME OUT, ACCESS CODES, CALL SIGN, LISTENS FOR CLEAR FREQ BEFORE TRANSMITTING

DUPLEX SYSTEM & REPEATER CONTROL

MODEL CS64R FULL DUPLEX SYSTEM
ALL ABOVE FEATURES PLUS REPEATER CONTROLLER, WITH, HANG TIME, COURTESY BEEP, REPEATER ON/OFF ACCESS CODES, AUTOMATIC VOICE ID, ALL TIMERS SET FROM START-UP MENU * YAESU 2700 VHF/UHF MAKES INSTANT CROSSBAND REPEATER, NO DUPLEXER! *DUPLEX VERSION AVAILABLE ON CARTRIDGE *NO DRIVE REQUIRED (SEND US YOUR PARAMETER DISK)

MODEL CS64 (SIMPLEX) $229.95
MODEL CS64R (DUPLEX) $249.95
INC. SOFTWARE DISK-HARDWARE-CABLES-MANUAL

MODEL CSR64 USB/LSB MOD KIT FT757 $29.95

NO FILTERS!
NO FALSING!

TOUCHTONE DECODER KIT

*SSI 201 DTMF RECEIVER KIT
*RECEIVE ALL 16 DTMF DIGITS
*NO ADDITIONAL FILTERING
*OUTPUT BCD OR HEX FORMAT
*LOW POWER DRAIN (29MA/12V)
KIT INCLUDES 3.58 MHZ XTAL 22 PIN IC SOCKET, RESISTOR CAPACITORS, DATA SHEET SCHEMATICS; EASY TO BUILD **MODEL TTK $ 22.95**

4 DIGIT SEQUENCE DECODER (ON/OFF)

*WIRED AND TESTED; 5 TO 12V.
*USER PROGRAMABLE 50,000 COMBINATIONS ANY 16 DTMF TONES *SEND CODE ONCE TO TURN ON; AGAIN TO TURN OFF* MOMENTARY AND LATCHING OPEN COLLECTOR TRANSISTOR OUTPUTS *CUSTOM IC ASSURES HIGH RELIABILITY LED DECODE INDICATOR * INSTRUCTIONS & SCHEMATIC USE AS REPEATER ON/OFF **MODEL TSD $59.95**

"DECODE-A-PAD"

DTMF TO RS 232 300 BAUD INTERFACE

USE YOUR COMPUTER TO DECODE DTMF TOUCHTONES * RECEIVE ALL 16 DIGITS AS FAST AS THEY CAN BE TRANSMITTED * EASILY PROGRAM YOUR COMPUTER IN BASIC TO DECODE MULTIDIGIT "STRINGS", DISPLAY DIGITS, SOUND ALARMS, OBSERVE SECRET CODES * SIMPLE TO INSTALL; HOOK 12 VDC, AUDIO & TWO WIRES TO YOUR COMPUTER -- ENTER A SIMPLE BASIC PROGRAM (PROVIDED) AND BEGIN TO DECODE * INCLUDES DATA LED; WIRED AND TESTED-- **MODEL DAP $ 89.95**

CS-8 LATCH CONTROL OPTION

TURNS UP TO EIGHT DEVICES ON AND OFF WITH VOICE CONFIRMATION WHEN IN THE H.F. REMOTE MODE * 3 DPDT 2 AMP RELAYS INCLUDED & 5 MORE OPEN COLLECTOR 100MA. OUTPUTS * PLUGS INTO JOYSTICK PORT * INC 24 PIN CONN **MODEL CS-8 $79.95**

TWO METER REMOTE CONTROL

"REMOTE-A-PAD"

MAXIMUM FUNCTION CONTROL! KEYPAD CONTROL PLUS 2 FOUR DIGIT SEQUENCE DECODERS (TSD)* USE THIS BOARD TO CONTROL ANY 16 DIGIT KEYPAD REMOTELY WITH DTMF * SIMPLY HOOK 4 ROWS & 4 COLUMNS FROM YOUR KEYPAD YOU WISH TO CONTROL TO THE RAP-1 * *UNLEASH THE POWER OF YOUR RIG'S MICROCOMPUTER * SCAN, ENTER FREQUENCIES TURN YOUR LINKS ON & OFF CONTROL KENWOOD 2500/7950 & MORE, ADD 2MTR REMOTE TO CS64 **MODEL RAP-1 $ 149.95**

ICOM IC-02AT USER'S "AUDIO BLASTER"

MODULE INSTALLS INSIDE THE RADIO IN 10 MIN. BOOST AUDIO TO NEARLY ONE WATT! *LOW POWER DRAIN (4MA. STAND-BY) *COMPLETE INSTALLATION INSTRUCTIONS INCLUDED * CORRECTS THE LOW AUDIO PROBLEM * 1000'S OF SATISFIED CUSTOMERS! FOR IC02AT/IC04AT/IC2AT

MODEL AB1 $19.95

ENGINEERING CONSULTING
583 CANDLEWOOD ST.
BREA, CA. 92621
TEL 714-671-2009

( )MODEL( ) $
( )MODEL( ) $ TOTAL$
NAME TEL( )
ADDR CALL
CITY STATE
MC/VISA # EXP

Joseph Nardo WD6R
231 Timber Road
Newbury Park CA 91320

Bozo And The B-Hunt

Want to light a fire under that snoozing group of old-timers you call a club? Want to put some fun back into ham radio? Want free beer? Read on.

You are likely to hear some very strange transmissions if you are traveling through Southern California monitoring the WA6OBT 147.285/.885 repeater. How strange? Here are three recent transmissions:

"The music stopped; the lady died."

"If you are near the Inn, you can see my grin."

"A man was convicted of a crime; the judge set him free; you would have too."

As you listen more carefully, you begin to hear many questions being asked in rapid succession. Only a simple "yes" or "no" is heard in response. The questioning becomes so heavy that stations are heard doubling or tripling with each other as each excitedly tries to ask a question.

> ***". . . the company of friends and families was the best part of a creative hunt."***

"What in the world are you listening to?" your companion asks.

You have just encountered either an exciting B-hunt in progress or the challenging Riddle Night, two very popular activities which have sprung up on Larry King's repeater (known affectionately as Bozo).

In just a few months, these unique activities have renewed old companionships, introduced new friends, and are providing an opportunity for members of the Conejo Valley Amateur Radio Club (CVARC) and other users of the WA6OBT repeater to meet on a regular basis both on the air and in person.

The Birth of the B-Hunt

Locating hidden transmitters via use of two-meter amateur radio, more popularly known as T-hunting, is a sport which has been around a long time. The object is to find a hidden transmitter through the use of a special direction-finding antenna, attenuators, a map, and a compass. A keen sense of direction, a competitive spirit, and a calculating mind also help. The traditional T-hunts have been a monthly event in the Conejo Valley area.

During a discussion on the air one evening, I offered a challenge for a different type of T-hunt. Instead of the usual equipment, a different set of skills would be required to locate the hidden transmitter. A series of clues would be given which, when solved, would lead the hunters to the hidden transmitter. The first operator to find the transmitter would be treated to a beverage of his or her choice, hence the name B-hunt.

The response was quite positive as the word spread of the upcoming activity.

"When is the B-hunt going to start?" was heard as stations gathered on the specified evening. People were actually showing up to participate!

The hidden transmitter operator finally announced his arrival on frequency. The rules were read and the first clue was given.

There was no hesitation as questions began to fly in an effort to solve the clues as quickly as possible, with each participant trying to be the first to locate the hidden transmitter. Clues were given every five minutes. A new clue was given only after the previous clue was solved.

Within approximately thirty minutes a winner arrived, a husband and wife team, no less, to find the hidden transmitter in the parking lot outside a local watering hole. It was decided to use the parking lot for the first hunt since it might have been a disturbing sight to see someone sitting inside the establishment talking into a "police-type" radio, suspiciously responding yes or no over and over.

The hunt continued for the other participants. Once the hunters moved inside, the owners and other patrons became quite interested in the activity, asking many questions about the hunt and amateur radio.

From B-Hunts to R-Hunts

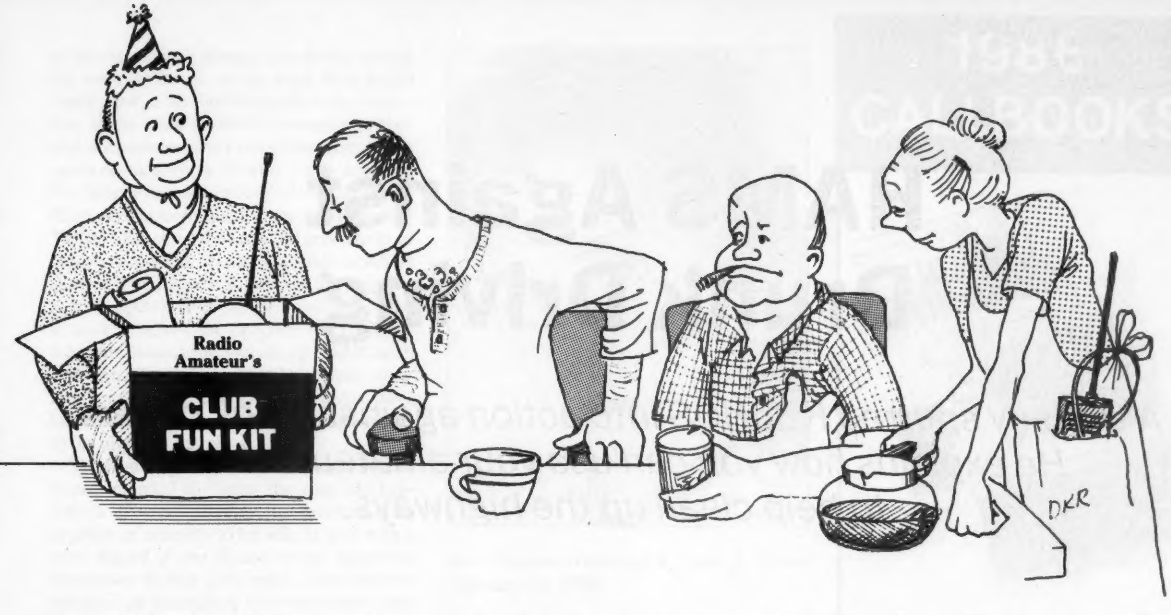
B-hunting proved to be an instant success. Another hunt was quickly scheduled for the next week, with the winner of the first hunt responsible for "hiding" the next week. At the conclusion of the second B-hunt, there was a discussion about expanding the hunts to include XYLs and other family members. The B-hunt quickly changed to an R-hunt, a restaurant hunt.

When the R-hunt began, wives, children, and friends joined in the fun. Again, the rules were reviewed. Clues were given and eventually solved, and we all wound up at the local pizza parlor, enjoying good food and company and swapping "war stories" of the hunt.

LMNOP Night

The B-hunts and R-hunts not only grew in popularity but also soon generated some very creative thinking. Finding new locations along with developing challenging clues was turning out to be as much fun as the hunt itself and led to a new wrinkle, an LMNOP Night.

Curiosity over what an LMNOP Night might be caused much speculation. Inquiries and guesses flourished on Bozo. One operator thought he actually had it figured out long before the event was to take place.



Hunt night finally arrived. Many anxious operators were awaiting the first set of clues. The hidden operator announced his arrival. The rules were reviewed and the first clue was repeated: "LMNOP."

After approximately one hour and dozens of questions, LMNOP was finally unraveled—"Light Meal Night On Potatoes!"

That was only the beginning. Somewhat mistakenly, the questions centered around attempting to identify a specific restaurant which specialized in potatoes. There are restaurants that specialize in pizza, pancakes, fish, or hamburgers, but potatoes? That was a tough one!

Additional clues were given:

"If you are near the Inn, you can see my grin" was quickly cracked by one operator. Soon, the first arrival was announced. The search continued with additional questions and clues; each succeeding clue was a little more revealing and helpful. Other arrivals were announced.

Finally, the last clue did it for the less fortunate hunters:

"Some call it home; ever be it so humble; it may not be neat but ever so sweet."

The "restaurant" was not a restaurant—it was the home QTH of Ray WB6HDG and Nancy WA6PRW Biederman. And what a delightful meal it was, of potatoes, sour cream, chives, cheese, wine, vegetables, etc. Again, the company of friends and families was the best part of a creative hunt.

And Riddles, Too!

"Riddlistics" is generating considerable interest and participation on Bozo, too; it began almost simultaneously with the unusual alphabet hunts. One evening I asked if there was interest in solving a riddle. The adventuresome group replied, "Let's go!" I gave the riddle:

"The music stopped; the lady died."

As with the hunt clues, only yes or no questions could be asked, with the object being to figure out the situation described by the riddle. After approximately two hours and nearly 100 questions, the riddle was solved.

The solution? This riddle describes a circus act in which a blind female tightrope walker uses the music of the band to tell her when she is at the end of the rope walk. When the music stops, she knows she can then safely step onto the platform which is directly in front of her. Unfortunately, one evening the music stopped a few beats early and, thinking she was at the end of her walk and near the platform, she stepped off early and fell to her death.

Riddle Nights not only challenge local hams but they attract other hams from neighboring communities. Mobile operators passing through the area have joined in as well. Riddle Nights now occur at a moment's notice. Some riddles have been solved within five minutes. Others have taken several hours. Any riddle is welcomed. Some have been quite challenging. Others have bombed.

Some Simple Rules

To make the activities both challenging and enjoyable for all participants, a few simple rules have been developed:

Foremost, all proper conventions of legal operation must be observed. Timely station identification is a must at all times.

The repeater always remains available for emergency traffic or other regular use, as needed.

Good taste is always practiced.

Only questions which require a yes or no response are permitted for both the hunts and riddles.

Questions regarding geographical locations are not permitted for the hunts, e.g., "Are you east of Main Street?"

No direction-finding equipment is permitted.

For the hunts, approximately seven to ten clues are prepared and given in decreasing order of difficulty. Developing challenging clues has been as much fun as the hunt itself.

New clues can be given only after the previous one has been solved or clues can be given every five minutes or so to speed up the hunt, if time is a factor.

No one is excluded. Many new friends have been made as a result of the hunts and Riddle Nights.

Locations are not given away by the winners. Once the hidden transmitter has been located, the hunt continues. Everyone is encouraged to find the location. Getting together has been the best part!

If someone solves a riddle quickly, a phone call is made to the "riddle control operator" to check out the answer, thereby not giving the solution away over the air. In fact, one riddle was solved in five minutes by one person and it took others over an hour to come up with the answer. Phone calls keep Riddle Night going for the other participants.

Join the Fun

Riddle Nights and the alphabet hunts are easily adaptable to any community. They may be just the thing your area or club could use to generate some interest among your repeater users and to encourage more frequent friendly get-togethers.

If, by chance, you pass through the Conejo Valley area and are monitoring Bozo (147.285/.885)—be prepared. You may hear a riddle in progress and be tempted to join in. Do so!

Get Started

Interested in getting your area started? How about starting with this very challenging riddle:

"A blind man walked into a restaurant and ordered albatross from the menu. When it was served, he asked the waiter if it really was albatross. The waiter replied yes; the man took out a gun and shot himself."

An SASE will get you the answer. ■

Richard A. Balser KB6HQS
17955 Medley Drive
Encino CA 91316

HAMS Against Drunk Driving

A tragedy spurred KB6HQS into action against drunk drivers. He explains how you can use your amateur talents to help clean up the highways.

I am a 17-year-old senior at the Oakwood School, a small private high school near Los Angeles. I have had my Advanced-class license since August of 1985. I have always been fascinated by ham radio, and I've always tried to use my ham skills to their fullest potential. When I started my senior year in September of 1985, many people at my school knew about, but did not really understand, my special hobby. I was looked upon mostly as a "science enthusiast." There was a girl at school with interests totally different from mine—she was enthralled by the theater and the arts, and she wanted to become an actress. Her name was Alexandra Vincent, and she was one grade level below me.

On Monday morning, February 24, 1986, we learned of a tragedy that had taken place overnight. Alex had been traveling on a local freeway at about midnight when a problem developed in her car. She pulled over into the emergency lane, turned on her emergency lights, and then phoned her mother and a towing service. After both had arrived, Alex needed to present her emergency road service card. As she leaned through the front left window to reach for her purse, a white Blazer—driven by a drunk man who had twice before been convicted of drunk driving—crashed into her car and instantly killed her.

It is not possible to write about the grief felt for Alex, or the anger and hate felt for the man who killed her. Everybody at our school was devastated and bewildered by Alex's death, yet the student body soon channeled its negative feelings into the formation of a chapter of SADD (Students Against Drunk Drivers). It was more difficult for me. I felt as if I belonged to the amateur community more strongly than anywhere else, so I wanted to do something using amateur radio to commemorate her, to channel the hate I had for the drunk driver who took Alex's life into something positive. Perhaps ham radio could be used to prevent other people from being killed by drunk drivers.

In the weeks after Alex's death, I devoted all the time I could toward forming a group of amateurs who would voluntarily report drunk drivers on the highway—by relaying reports through base stations to the highway patrol. While this procedure had been going on for a long time, and hams were occasionally reporting drunk drivers, there was no organized effort toward making hams recognize that drunk drivers are a special problem that *can* be dealt with. I wanted to educate my club about drunk driving. Many members were unaware, for example, that every year 25,000 Americans die, and another 1.5 million are injured because of drunk drivers. On weekend nights, an average of one out of every ten vehicles on the road is driven by a legally drunk driver.

> **"A prepared amateur . . . can be of excellent service to the community if he or she does encounter a drunk driver."**

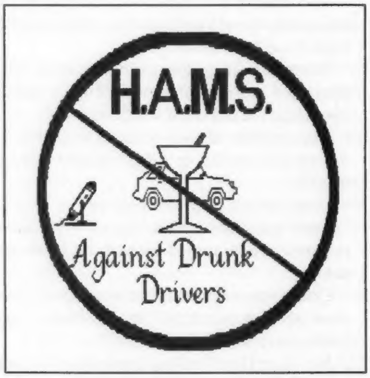


Fig. 1. The HAMS logo.

I wanted to educate my club's members about how they, as hams, could help control the drunk-driving situation. Many amateurs don't know how to report a drunk driver, or they think it's much harder than it actually is, or they're in doubt when they see a hazardous driver. Perhaps they think it's not worth taking up a repeater to put in a call which most likely will be ignored anyway. I wanted to put these false suspicions to rest.

As it turns out, it's very easy to report a drunk driver. When in doubt, it *is* better to report the vehicle and have it checked out by the police. By not reporting it, you are allowing a possible highway catastrophe to happen. The highway patrol will take action if it receives a *well-defined, concrete, and legitimate report.* All it really takes is a ham with a hand-held or mobile radio to report a suspicious vehicle to a base station. The mobile operator then passes on to the base-station operator the suspicious vehicle's highway location, direction, approximate speed, make, color, year, and license-plate number (or as much of this information as is known). The base then passes this information to the local sheriff or highway patrol (whichever is appropriate for your area). A convincing way for a base-station operator to report an incident is to place the phone against the base radio speaker, so the officer hears the mobile operator report the incident firsthand. The base-station operator should then record all the information in his or her logbook or records.

Having spoken with the highway patrol office, I began speaking to other hams, giving them the facts and showing how it is possible to help stop drunk drivers. I have also spread the word on the air, in our local Ham Radio Outlet, and in our San Fernando Valley Amateur Radio Club (W6SD) newsletter. Other club newsletters have printed my information about drunk drivers, as well. I also arranged for Officer Ken Rosenberg of the California Highway Patrol to speak to the San Fernando Valley ARC about the facts and procedures of reporting a drunk driver. The club members showed a willingness to support the program and are optimistic about their ability to make it work. I named the program the Highway Amateur Monitoring System, or HAMS as an acronym. Since then, there have been many incidents on the air in which hams have helped people on the road by making a report to the highway patrol.

The Highway Amateur Monitoring System is *not* intended to "scan the road for hazardous drivers." Rather, its function is to *prepare* an amateur to be able to deal with a road hazard if one should occur. Amateurs who have mobile gear must know how to perform an emergency communication, and they must know that the highway patrol is on their side and will respond to an emergency call. A trained amateur can report a disabled vehicle, an accident, a highway injury, or basically anything that poses a hazard to traffic or individuals on the highway. For example, on March 26, Ken Yaecker N6NHA called in on our local repeater and reported a stranded vehicle in the center divider lane of the freeway. The driver of the vehicle was too frightened to get out of the vehicle to call for help. But, because of Ken's radio call, a base station reported the information to the highway patrol, which then dispatched an officer to the site.

On another occasion, Hal Samuelson W6GXG drove by a vehicle that had pulled into the emergency lane. Inside, the driver lay back against the seat. While unsure about the condition of the driver, W6GXG reported the incident using his mobile radio. The highway patrol soon arrived and discovered that the driver of the vehicle had suffered a heart attack and was unconscious. Paramedics were then summoned to the site. This man could have died in his car had it not been for W6GXG's suspicion that something was wrong.

A prepared amateur can be of excellent service to the community if he or she does encounter a drunk driver. For example, at around 11:30 pm on Saturday, March 1, just five nights after Alex Vincent's death, a report came on our repeater about a recklessly driven tractor-trailer that was swerving and making S-maneuvers at about 70 miles per hour on the highway. The report came from an amateur with a mobile 2-meter radio who was traveling behind the tractor-trailer in the Gorman area, a dark, mountainous area north of Los Angeles. I answered his call and phoned the highway patrol, placing the phone against the speaker of my base radio so the officer heard the mobile ham directly relay the information about the vehicle. After the report was complete, a vehicle was dispatched. Twenty minutes later, the mobile ham reported that the highway patrol had stopped the still recklessly driven tractor-trailer and pulled it off the road. Had it not been for the ham-radio effort, the tractor-trailer could have killed somebody.

Alex Vincent—Victim of a drunk driver on February 24, 1986.

These incidents illustrate some of the ways in which the HAMS effort has been a success. Obviously, not every incident on the road will be witnessed by a ham, and nobody can force a ham to call in something he or she sees on the highway. But it is possible to educate the amateur community about drunk drivers and highway communications—as I have done in the San Fernando Valley.

The drunk driver suspected in Alex's death was brought under "suspicion of vehicular manslaughter." Witnesses who saw the drunk driver minutes *before* the crash took place were needed to testify as to how he was driving on the road. If a base-station operator logs the information received about a recklessly driven vehicle and if, a few minutes later, the vehicle causes a fatality or an injury, then the amateur operating the base station can use those records to provide evidence as to how the vehicle was being operated moments before the crash. It could help to get a conviction.

As I continue the HAMS effort, I strongly encourage all readers to do as I have done. Become involved and contact your local sheriff or highway patrol. Invite an official to talk to your radio club about the facts of drunk driving and how to report a drunk driver. Any time that a ham reports a drunk driver, he or she is potentially saving someone's life. We hams have a great capability to talk to each other with our hand-helds, mobile radios, and repeaters. Isn't it worth taking up three minutes of air time to use these capabilities to help prevent a possible catastrophe?

Drunk drivers cannot be completely eliminated. But, with your help, we can reduce the hazards on our highways and prevent tragic deaths—such as that of Alexandra Vincent, whose goal was "to do something special" for everyone she met. ■

1986
CALLBOOKS

The "Flying Horse" has a great new look!

It's the biggest change in Callbook history! Now there are 3 new Callbooks for 1986.

The North American Callbook lists the amateurs in all countries in North America plus those in Hawaii and the U.S. possessions.

The International Callbook lists the calls, names, and address information for licensed amateurs in all countries outside North America. Coverage includes Europe, Asia, Africa, South America, and the Pacific area (exclusive of Hawaii and the U.S. possessions).

The Callbook Supplement is a whole new idea in Callbook updates. Published June 1, 1986, this Supplement will include all the activity for both the North American and International Callbooks for the preceding 6 months.

Publication date for the 1986 Callbooks is December 1, 1985. See your dealer or order now directly from the publisher.

☐ North American Callbook	
incl. shipping within USA	$25.00
incl. shipping to foreign countries	27.60
☐ International Callbook	
incl. shipping within USA	$24.00
incl. shipping to foreign countries	26.60
☐ Callbook Supplement, published June 1st	
incl. shipping within USA	$13.00
incl. shipping to foreign countries	14.00

SPECIAL OFFER

☐ Both N.A. & International Callbooks	
incl. shipping within USA	$45.00
incl. shipping to foreign countries	53.50

* * * * * * * * * * * * *

Illinois residents please add 6¼% sales tax.
All payments must be in U.S. funds.

RADIO AMATEUR callbook INC.
Dept. B
925 Sherwood Dr., Box 247
Lake Bluff, IL 60044, USA

✓31
Tel: (312) 234-6600

Peter H. Putman KT2B
84 Burnham Road
Morris Plains NJ 07950

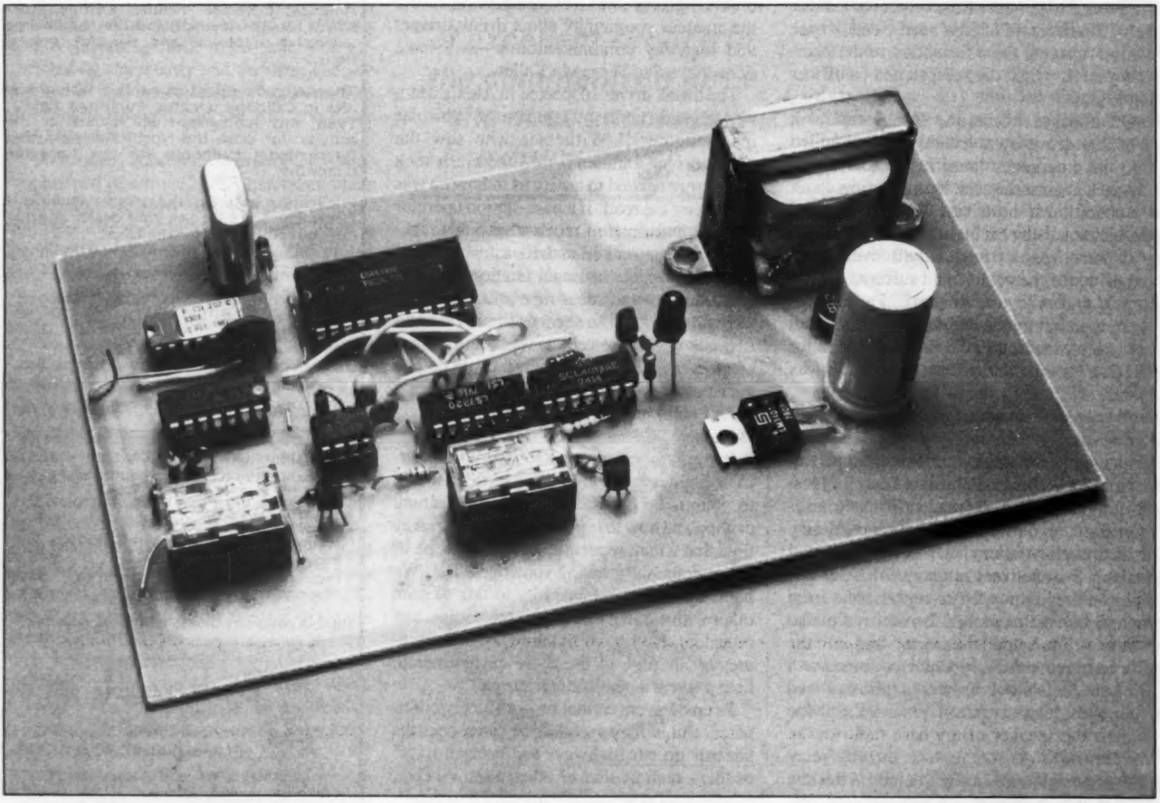
The Piggy-Bank Patch

Pete Putman completes the picture with an autopatch for his Piggy-Bank Repeater.

Many of the readers who contacted me after the publication of my simple repeater-control project ("Piggy-Bank Repeater Project," *73*, June, 1984) expressed interest in a companion autopatch controller, but at a budget price. The good news is that your wait is over!

This article describes a simple DTMF touchtone™ controller that uses inexpensive but reliable parts. Most parts can be obtained from the nearest Radio Shack store; the balance you can get from mail-order semiconductor houses. The circuit is relatively foolproof and offers secure, five-digit access and single-digit dump. Provisions have been made for muting the transmitted access tones, and the entire circuit interfaces with the Piggy Bank controller to provide dependable timeouts and disconnects, if needed.

The heart of the circuit is Silicon System's SSI 202 chip, which is a complete DTMF decoder with band-splitting filters built in. All you need to make it work are a 1-megohm resistor, a 0.01-uF input-coupling capacitor, and a standard colorburst crystal (3.579545 MHz)—all of which are easily obtained.



Your repeater's new autopatch: inexpensive, foolproof, reliable, and secure.

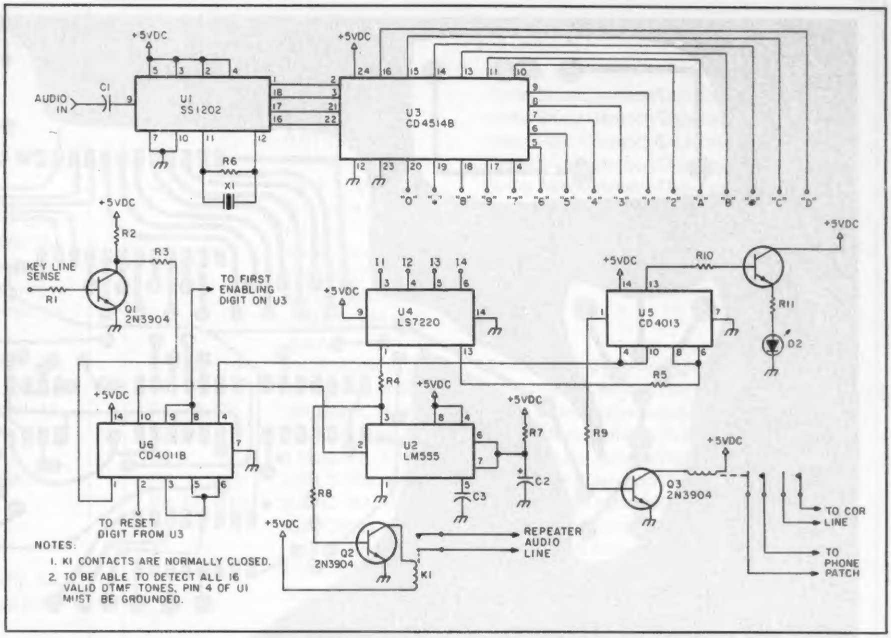


Fig. 1. Schematic diagram.

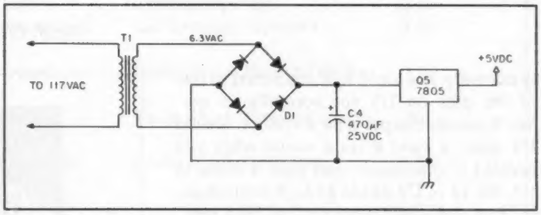


Fig. 2. Power supply for the autopatch.

The SSI 202 runs from a supply voltage of 5 volts, and its output is either configured as 4-bit hexidecimal code, or binary 2 of 8. In this particular circuit, the hexidecimal code is used to drive a CD4514BE 4-to-16-line decoder, providing the necessary decoded digits. The SSI 202 has proven itself to be a reliable performer and exhibits excellent speech immunity. In fact, when the prototype was fabricated, I deliberately overdrove the input stage to see if the distorted audio products would create harmonics which would somehow "decode" as a valid digit. They did not!

Here's the interesting part: LSI Computer Systems of Melville, New York, has long offered a keyless-lock IC, type LS7220, to be used in automotive ignition lock systems. This chip is both inexpensive and flexible and lends itself well to a secure autopatch access system. In order to do its job, the LS7220 must detect five valid logic 1 signals in order at its inputs.

The first logic 1 is applied to SENSE INPUT to enable the chip to detect the remaining four signals. These are all momentary states and must be applied in the correct sequence. If any logic 1 signal is applied out of sequence, the entire chip resets to a zero state including all previously-detected valid inputs.

Example: Assume the access code is 51432. As you input 5, 1, and 4, you've set the SENSE INPUT and unlocked two of the four inputs in order. However, should you input anything other than a 3 for the next digit, the entire sequence must be repeated as all pins are reset to zero.

Once the correct sequence is accessed, the output pin, called LOCK CONTROL OUTPUT goes high and can be used to control a small relay. It also works well as a relay driver for high-current applications. This output will stay high as long as one of two things happens: (1) the SENSE INPUT is held high, or (2) a logic 1 is applied to the SAVE INPUT. For our purposes, we'll use option #1.

Refer to Fig. 1 for the schematic. Incoming line-level audio is fed through C1 to pin 9 of U1, SSI 202. R1 and X1 form the reference oscillator across pins 11 and 12. Valid digits are detected and appear as a hexidecimal code at pins 1, 18, 17, and 16. These in turn are connected to pins 2, 3, 21, and 22 of U3, a CD4514 4-to-16-line decoder. All 16 DTMF digits appear as a momentary logic 1 at pins 4–11 and 13–20 of U3; depending on the digit entered.

Let's say the first digit of the access code is 5. When a valid 5 is detected by U1, pin 6 of U3 goes high momentarily. This pin is inverted by U6C, a CD4011 quad NAND gate through pins 8 and 9 (which are tied together). Pin 10 goes low momentarily, which triggers U2, an LM555 one-shot. The output of U2 goes to two places: First, it drives Q2, a 2N3904 relay driver. This relay momentarily interrupts repeater audio and mutes the DTMF tones from being repeated over the air. The muting interval is also the window in which the remaining four digits must be correctly entered. This interval is set by R2 and C2 and is typically 1.5–2 seconds.

The output of U2 is also sent to pin 1 of U4, an LS7220. This is the SENSE INPUT pin and must be tied high for the rest of the digits to be decoded. All of this takes microseconds to occur, so the dialing sequence can be fairly rapid—such as that initiated by an autodialing microphone.

Now that the tones are muted and the keyless-lock chip is enabled, the next four digits, 1432, sequentially decode the LS7220, and pin 13, LOCK CONTROL OUTPUT, will go high. The only problem is that once the window closes as U2 resets, the SENSE input will go low and U4 will reset.

Here's where U5A comes in. U5 is a dual D flip-flop. U5A actually controls the autopatch and COR LOCK relays—not U4. When U4 is set high at pin 13, this voltage goes to pin 6 of U5A. This is the SET line for the flip-flop. However, pin 4 must be tied low in order for the flip-flop to be set.

This is accomplished in a rather unique and clever manner! Q1, another 2N3904, senses the transmitter key line from the repeater controller. This line must go high on transmit. When someone keys up the repeater to dial up the patch, the transmit key line goes high and Q1 inverts this signal. It is then fed to pin 1 of U6A, another NAND gate. Pin 2 is normally low (we'll get back to that) so the output of the gate—pin 3—goes high. This signal is inverted again and debounced through U6B. The output of pin 4 is now low while the transmitter is keyed up and this goes to pin 4 of U5A, the RESET line! Follow me so far?

After the correct sequence has been dialed, the SET line (pin 6 of U5A) goes high and the Q output of U5A (pin 1) also goes high. This drives Q3, yet another 2N3904, which pulls in R2. This relay actually turns on the autopatch, but also it is connected to your repeater's COR line and either grounds it or ties it high, depending on what's needed to make the repeater stay keyed.

Now the input signal can be dropped since the autopatch will hold the repeater on, and while it is on the transmit key line keeps the autopatch operative. The two circuits actually hold each other up! While this is all happening the repeater timeout timer is running (one hopes) and will play an important role which will be covered in a moment.

Let's go back now to pin 2 of U6A. This pin

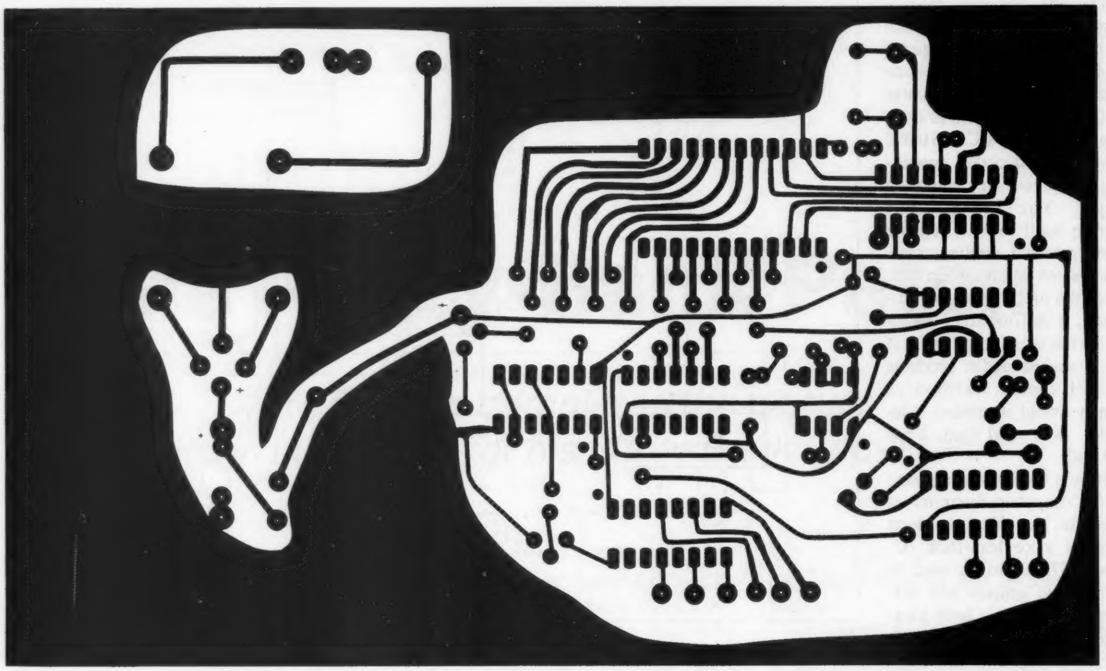


Fig. 3. Circuit board, foil side.

is normally low since it is connected to one of the pins on U3 not normally in use. We'll assume that pin is the # symbol. Should U1 detect a valid # (as it would when you decided to disconnect) and pass it along to U3, pin 14 of U3 would go high momentarily. This also would drive pin 2 of U6A high, thus causing pin 3 to go low. This would invert through U6B, which would then drive pin 4 of U5A high, thereby shutting off the autopatch and releasing the COR line. Clever, eh?

Now let's assume that in the middle of your call your batteries go dead. Horrors! You can't shut the patch off and there isn't a spare battery in sight. Not to worry, for the repeater timeout timer will run its course and shut the transmitter off. The minute this happens, the key line sensed through Q1 will go low. The signal is inverted, and this time pin 1 of U6A is tied low—not pin 2. The effect is the same, however. The RESET line of U5A will go high and *clunk,* off goes the autopatch. This is what makes the system foolproof—assuming the timeout timer works okay. If it doesn't, you'd be off the air anyhow as this is an FCC requirement for repeaters.

The other half of U5 is put to use to drive a small LED through Q4 to indicate that the system is up. Also, should you desire to inhibit the patch for any reason, put a switch with the key-line-sensing transistor, Q1, and your transmitter will keep pin 4 of U5A tied high when it is shut off. No matter what you do, you can't bring up the patch as long as pin 4 is tied high.

Incidentally, you can drive your COR line directly from pin 13 of U5B if you don't need the LED indicator. Pin 13 goes high when the patch is on, and can hold a COR open through a 10k resistor. For low-going COR circuits, use pin 12 of U5B through a 10k resistor.

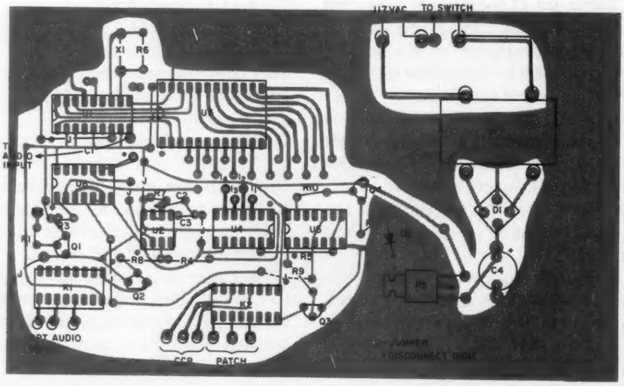


Fig. 4. Parts placement diagram.

The power supply is simple indeed (Fig. 2). T1 is a 6.3-V-ac, 300-mA transformer. Rectifier D1 is a full-wave bridge which feeds C4 and Q5, a 5-volt regulator. The entire board measures only 6-3/4" x 4" and fits in a standard enclosure. The photo shows the assembled unit. Fig. 3 is a full-size template for the PC board, and Fig. 4 shows parts placement.

The actual patch circuit is up to you. The old Heathkit™ makes an excellent choice, and there are other models floating around the market which will do the job nicely. You could even fabricate something yourself, if need be.

Here's the best part: All of the parts with the exception of U1, U3, and U4 can be bought right down at your local Radio Shack store. U1, the SSI 202, may be bought from Hallmark Electronics (See below for address).

U3, the CD4514, is available from Jameco Electronics, but since they require a minimum order of $20.00, you might wish to get most of the parts there as well. Otherwise, the

Sources for the SSI 202 chip:

Engineering Consulting*
583 Candlewood Street
Brea CA 92621

Hallmark Electronics**
107 Fairfield Road
Fairfield NJ 07006

*—This company advertised a complete kit for $22.95 for the SSI 201, the predecessor to the SSI 202. The chips are NOT compatible, but they may now be selling SSI 202 kits. It's worth an inquiry.

**—Hallmark does stock the SSI 202 and the cost per unit, as of this writing, in small quantities was $25.00 apiece. Write for ordering information.

Source for the LS7220 chip:

LSI Computer Systems, Inc.
1235 Walt Whitman Road
Melville NY 11747

Prices vary depending on quantity, but range from $3.50 to $3.00 apiece. Shipping extra.

Sources for the CD4514 chip:

Jameco Electronics
1355 Shoreway Road
Belmont CA 94002
Min. Order: $20.00

Digi-Key Corporation
PO Box 677
Thief River Falls MN 56701
Min. Order: None

chip can be purchased over the counter at most semiconductor houses.

U4, the LS7220, is available from the manufacturer, LSI Systems of Melville NY.

Now, with your Piggy-Bank controller and autopatch, all you need is an inexpensive repeater. Hmm! ■

Parts List

Component	Description	Source	Price (each)
C1	0.01 uF, 50 volts	Radio Shack/Jameco/Digi-Key	.39
C2	4.7 uF, 25 volts*	Radio Shack/Jameco/Digi-Key	.49
C3	0.01 uF, 50 volts	Radio Shack/Jameco/Digi-Key	.39
C4	470 uF, 35 V dc	Radio Shack/Jameco/Digi-Key	.99
D1	1.5 A, 50 piv Full-wave bridge rectifier	Radio Shack/Jameco/Digi-Key	1.09
D2	2-V-dc, 20-mA LED	Radio Shack/Jameco/Digi-Key	.69
K1, K2	DIP DPDT relay, 5-V-dc coil contacts 125 V dc @1 A	Radio Shack #275-215	3.99
Q1–Q4	2N3904/2N2222 type	Radio Shack/Jameco/Digi-Key	.69
Q5	7805 5-volt regulator	Radio Shack/Jameco/Digi-Key	1.59
R1, R3, R4	10k Ohms, 1/4 Watt	Radio Shack/Jameco/Digi-Key	.39
R2, R5	47k Ohms, 1/4 Watt	Radio Shack/Jameco/Digi-Key	.39
R6	1 Megohm, 1/4 Watt	Radio Shack/Jameco/Digi-Key	.39
R7	470k Ohms, 1/4 Watt*	Radio Shack/Jameco/Digi-Key	.39
R8, R9, R10	2.2k Ohms, 1/4 Watt	Radio Shack/Jameco/Digi-Key	.39
R11	1.2k Ohms, 1/4 Watt	Radio Shack/Jameco/Digi-Key	.39
T1	117-V-ac Primary, 6.3-V-ac @ 300-mA Secondary	Radio Shack #273-1384**	2.59
U1	Silicon Systems SSI 202 DTMF Decoder	Hallmark Electronics	25.00
U2	TLC555 Timer	Radio Shack/Jameco/Digi-Key	1.19
U3	CD4514B 4-to-16-Line Decoder	Jameco/Digi-Key	3.49
U4	LS7220 Keyless-Lock IC	LSI Computer Systems	3.50
U5	CD4013 Dual-D Flip-Flop	Radio Shack/Jameco/Digi-Key	1.19
U6	CD4011 Quad NAND Gate	Radio Shack/Jameco/Digi-Key	.99
X1	Colorburst Crystal 3.579545 MHz	Radio Shack #272-1310	1.69

Notes:

All prices are taken from the 1985 Radio Shack catalog, except U1, U3, and U4.

*—These components determine the time constant for U2. They can vary to suit your needs. The designated components will provide a "window" of about 2 seconds.

**—The PC template was drilled to fit this particular transformer. It solders directly into the supplied holes. Cut off the solder tabs on top for safety.

Crystal Filters,
8 & 10 Pole for
Kenwood, ICOM,
and YAESU

NEW TS-440S SSB 2.1 kHz matched filter set: consists of one each 455kHz and one 8.8MHz 8 pole crystal filters - $150.00
TS-440S/430 2 Crystal Filter Package consists of 2.1 or 1.8 kHz SSB, 400 Hz or 250 Hz CW filters - $110.00; Individual crystal filters - $60.00 each.
TS-940/930 CW 400 Hz 8-Pole match set, mounted on printed circuit boards - $150.00.
TS-940/930 SSB - 2.1 kHz 8-pole matched set. - $150.00
930/940 SSB - Electronic Switch Kit - Transmit through original filters - $30.00
TS-430 - SSB 2.1 kHz Cascade Kit - $75.00
NEW FOR ICOM RADIOS
EXACT replacement for FL-44A $99.00
EXACT replacement for FL-52A $85.00
For ICOM 271/471
8 & 10 pole SS band filters $85.00/110.00
CW 400 Hz $85.00
FL30, FL32 & FL45 wire-in replacements $60
Check RS# for NEW filter selection guide covering many other radios.
INTERNATIONAL RADIO INC.
747 SW South Macedo Blvd. Port St. Lucie FL 33452
(305) 879-6868 ✓97 VISA

WORLD-TECH PRODUCTS
SALE PRICE ✓93
$34.95
List Price $44.95
Model
M3111A (S)

KNOW THE TIME
ANYWHERE - EVERYWHERE - INSTANTLY
- 12/24 Hour Time Piece.
- Dual Dial World Time Clock.
- Easy to read local time in cities around the world.
- Gold or silver time piece handsomely displayed in a smoked acrylic or clear stand.
- Daylight/Nighttime shown on 24-hr. dial.
- Accuracy assured to ± 15 seconds per month with quartz movement.
- Time piece diameter 6½", height 9", width 8". Uses 1 "AA" battery, not included.

ORDER YOUR CLOCKS TODAY
CALL (813) 442-5862
Florida resident add 5%. Please add $2.50 for shipping. or write: 1233 Kapp Dr., Clearwater, FL 33575

CTM
"...received my moneys worth with just one issue..."
—J. Trenbick
"...always stop to read CTM, even though most other magazines I receive (and write for) only get cursory examination..."
—Fred Blechman, K6UGT
U.S.A. $15.00 for 1 year
Mexico, Canada $25.00
Foreign $35.00(land) - $55.00(air)
(U.S. funds only)
Permanent (U.S. Subscription) $100.00
Sample Copy $3.50
CHET LAMBERT, W4WDR
1704 Sam Drive • Birmingham, AL 35235
(205) 854-0271 ✓11

Claire Azzalina
6 Muriel Road
Chelmsford MA 01824

Future Hams of America

CMARC shared the excitement of ham radio with 8000 visitors to the Boston Museum of Science.

Bob Salow WA1IDA's dreams came true when the Council of Eastern Massachusetts Amateur Radio Clubs, CMARC, an ARRL organization, dominated Boston's Museum of Science on April 26–27 for an extraordinary exhibition of amateur radio. Salow, the primary driving force, had devised and nurtured the plan for over a year before its fruition.

Why a science museum? Jim Fisk W1HL, President of the Billerica (Massachusetts) Amateur Radio Society, felt "a demonstration would not attract people to come to a museum." He believes that the main thing that attracts people to a museum in the first place is their natural curiosity. And he thinks it is *this* group of people that would be inclined to get involved in ham radio.

The museum identifies itself as "a world of ideas," with exhibits of natural history, physical science, medicine, and astronomy, but according to Salow, the one thing it lacks is electronics—specifically communication.

CMARC, with the support of the ARRL, saw the project as an unprecedented opportunity to promote interclub involvement of its 45 clubs. Salow recalled a similar event in 1977: "It was well attended. There seemed to be a lot of interest. My thought was [that] there should be some continuation of it."

April 26th was gray and cloudy—a perfect day to go to a museum. The exhibit, consisting of nine large curtained areas, occupied more than a third of the museum's lower level. Museum staff greeted visitors, passed out literature pertaining to amateur radio, and directed people to the various ham displays. In only two days, close to 8,000 people learned what amateur radio is all about.

One of the most popular attractions was code practice. Young and old alike received a 5-minute lesson and certificate of completion. Saturday's code instructor, Wayne Bethoney KA1NSE, said, "Everybody smiles when they get it right. Sending their name is the first big step. Women are very interested in joining. Kids and adults—the interest is mixed."

With certificate in hand, the FHA—future ham of America—rounded the corner to the next stop—to send a *real* message or to visit OSCAR.

One of the volunteers, Dana Tremblay

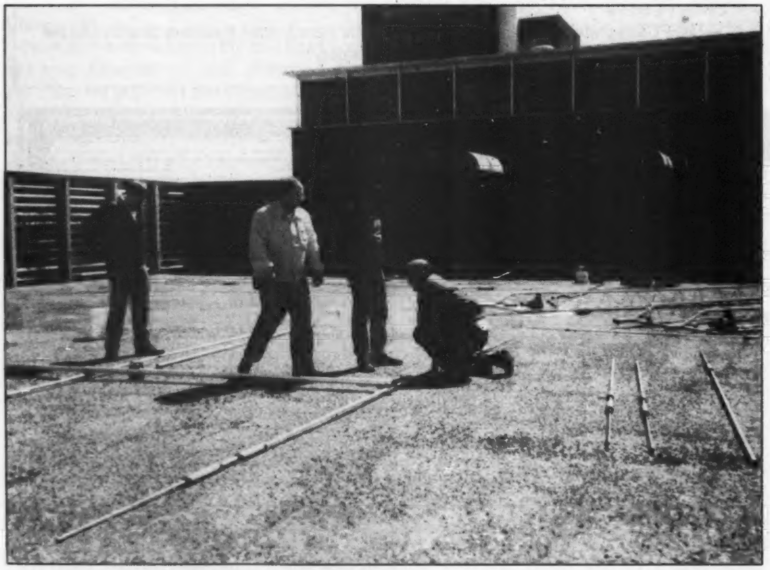


Photo A. One week before the exhibit opens: antenna assembly on the roof of the Museum of Science.

Smile
AMATEUR
SION

Photo B. "Look, Ma, I'm on TV."

WA1HUM, reported some technical difficulties: "It's probably one of the worst locations in the city you could have. The problem is interference." Part of the problem was overcome by ham ingenuity—a coffee-can configuration set up to act like a filter—and an AMSAT video showed what was supposed to be happening. Tremblay said, "People interested tend to be older, more sophisticated. The general reaction is 'Amateurs have a satellite up there?' They want to know how far away [it is], how much it costs, [and] how big it is—really."

Lines formed for the amateur TV display while giggling girls talked to a 15-year-old Wakefield, Massachusetts, ham. "Can he see us?" they asked. Bob Crowley, another CMARC volunteer, observed that both children and adults were fascinated by the video aspect of ham radio. "They want to know how to hook up the VCR they bought for Christmas. For kids who have been spoon-fed TV, it has immediacy." Other questions from the crowd, such as "Can you turn the channel and get someone else?" or "Who's filming this?" brought smiles to any ham within earshot.

Virginia Williams KA1KKS, who manned the message center, said, "They think it's fun to see the message sent. Mostly, they say, 'Ooooh, how can they do that?' We've had more messages from children than anyone else."

Packet radio, headed by Ron Reder KA1KCU, was another crowd pleaser. "Most people seem to enjoy it," he remarked. "They're very interested." But interest isn't always enough. "You have to go out and greet people," he continued. "Bring them into the booth. The approach has a lot to do with it, like [it did] to a second grader—her mom had to help her type."

The two-way HF communication setup brought in countries like Scotland and the Ukraine. Visitors were able to check various maps to see how far the signal was traveling. Gary Skuse KA1NJL, an enthusiastic worker, noted, "Little kids are awestruck. They think it's fantastic. They ask, 'Who are you talking to? How far out can you talk?' People seem very interested and want to get involved. It seems to be that children are more interested."

Pat Couture N1CKN directed the information station and was assisted by Libby Karpeij KA1DTU of the ARRL. Karpeij reflected on her involvement with the event: "I asked if I could observe. The whole thing was completely underway. I don't think it's been done on such a large scale. The more clubs that could do it, the better. But unless you have simply an enormous club, it's really not practical." According to Couture, the event was particularly significant because "this is the first time ham radio has gone into the public and interfaced on a large scale. Everybody is looking at this."

The ham spirit prevailed, as one Girl Scout leader commented, "I've never seen an exhibit as warm and friendly as this. People went out of their way to talk to [the girls] and draw people into the exhibits."

Photo C. A code class led by KA1NSE.

At the message center, Tom Kinahan N1CPE, a team leader, explained that "traffic originating at the museum was sent to remote station K1KTZ in Wellesley, Massachusetts, via packet links. At this station, all incoming messages were dumped to a printer and from here, they were routed via 2 meters, HF nets, and informal liasons to other destinations. All traffic was originated under the call KA1SM."

After it was over, museum staffer Phyllis Dohanian said, "It has worked out pretty well. The director would like to see something like this every weekend. I don't think it's a child's activity; you need motor skills and a level of intelligence. I tried to get Bob to focus on how things work—a key into science, to teach about any kind of radio transmission."

Salow's dream was to target the exhibition toward a preselected audience: "The objective, long term, is to get a permanent exhibit at the museum. I realize you can't put one in [with] *magic*. You have to get a degree of credibility, raise money, get equipment, and stock it."

No one knows exactly when the idea started, but fund raising for this event began long ago with the sale of a map showing 2-meter repeater locations in New England. The map was prepared with great care by Lew Nyman K1AZE. "The map sold very well," Salow said. "We sold ads to defray the cost. We printed it up and sold it for $2 at flea markets, hamfests, everywhere. The money enabled us to move on this."

The next step was to approach the museum. Salow tried to "find people with influence in the museum like Bradford Washburn, world famous and former director. We got names of people at the museum a year ago and waited. Nothing happened. We called them. It was very difficult to get in touch with them."

Dennis Shapiro W1UF—HF Station
Dave Craig WB1CEA—ATV
Dana Tremblay WA1HUM—Space Satellite
Ron Reder KA1KCU—Packet
Tom Kinahan N1CPE—Message Center
Ed LaJoie K1CB—CW Center
Pat Couture N1CKN—General Information
Bob Gibbons W1REP—Public Service—Emergency
Bob Salow WA1IDA—Coordinator

Fig. 1. Team leaders.

- ARRL literature
- Cushcraft catalog
- Internal checklists
- Radiogram for visitors
- List of Morse-code characters
- Participation certificate
- CMARC directory
- CMARC literature
- Press packet

Fig. 2. Literature given to participants.

Phyllis Dohanian of the museum's Service League mentioned some obstacles CMARC encountered that any group would encounter in an undertaking of this nature: "[CMARC] wrote the former director. [The museum bureaucracy] had mixed feelings. [They thought it would be] an activity where people participating [would have] fun, but [wouldn't] interact with museum visitors."

But Salow persisted. His ambition and perseverance finally succeeded: "Last October we made contact."

Another problem surfaced. Dohanian explained: "We have a very busy schedule. The museum couldn't give me the time and personnel to do it. We are run nonprofit and have to do things the cheapest way. People don't get paid the same way."

Guidelines were established for the proj-

Photo D. "CQ DX, CQ DX."

Photo E. Some of the CMARC volunteer staff.

ect. "We looked at it again," Dohanian said. "We wanted it [to be] scientific, educational, [and] interactive with museum visitors. We got together, mostly Bob and me, and talked about quite a number of logistics, dealing with the physical plant, electronic equipment interacting with electronic equipment at the museum."

Next, Salow "sketched out the budget and all kinds of other things. It did not move quickly. In February, we got the answer—OK. We had to set a date, but they couldn't give us a confirmation. It was March before we knew what was going to happen. We got a date in April."

Dohanian praised Salow: "He had the best way, a number of group leaders. When they needed something, he and the group leader would meet with the appropriate person."

Salow recruited and recruited and recruited, because "no one club could put together an exhibit without the knowledgeable people. Most clubs are general-purpose clubs." A great many hams were at the Dayton Hamvention, and so were unable to lend a hand.

So now they had the museum. They had the people. But what about equipment?

Steve Gilbert WA1AYS, a CMARC volunteer, is a walking success story. "I contacted Dave K1WHS on 2 meters. He owns the Main Monster, a 2-meter moonbounce station, one of the biggest stations in the world. He passed the word to his boss, Glen White of Cushcraft. My question was to borrow an antenna. He asked, 'What else do you need?' "

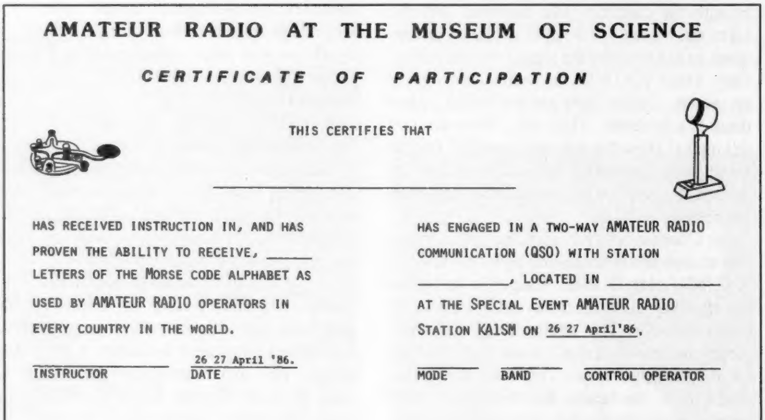
Gilbert's fancy footwork procured loans from Carol Cable of Pawtucket, Rhode Island, for 1,000 feet of 9913-equivalent, and another 1,000 feet of actual Belden 9913 from Belden Cooper Industries. Gilbert added, "The companies were tremendously helpful. You have to give them credit for more than giving us the stuff, but for the vision."

The challenge of erecting antennas was met with great vigor. Each of the nine antennas for the exhibit required 150–180 feet of feedline. Originating on the roof, the feedline was fed down through three floors, in and out of doors and windows to the basement. The real challenge was getting a 6-foot ham with a 5-foot tower through the boiler room, around a corner not much wider than his shoulder, and up two flights of stairs. Antenna sections were passed along like a bucket brigade and handed up to the man at the top of the stairs. Prior to the exhibit two consecutive weekends were needed to assemble, transport, and erect the metal monsters that would loom over the museum.

On May 24, 1844, Samuel Morse transmitted the first message on U.S. telegraph. 142 years later, a short distance from his birthplace, hams of the future watched messages on television, printers, and screens. The exhibit succeeded in bridging a gap between today's youths and the world of amateur radio. It proved beyond a doubt that almost 300 CMARC hams are anything but amateur. Salow commented once that "when you deal with me, you deal with perfection," and anyone who visited the museum that weekend would say that he was absolutely right. ■

Inside Tips

1. If you plan to have an exhibit, first write the museum director, head of exhibits, or someone in charge of special programs at a science museum, industrial museum, or any adult museum.
2. Arrange a meeting to discuss the possibility of an exhibit. Determine if the museum is willing to sponsor or co-sponsor it.
3. Allow a minimum of six months lead time, but a year is better.
4. Pray for rain. Perfect weather means low attendance.



AMATEUR RADIO AT THE MUSEUM OF SCIENCE

CERTIFICATE OF PARTICIPATION

THIS CERTIFIES THAT

HAS RECEIVED INSTRUCTION IN, AND HAS PROVEN THE ABILITY TO RECEIVE, ______ LETTERS OF THE MORSE CODE ALPHABET AS USED BY AMATEUR RADIO OPERATORS IN EVERY COUNTRY IN THE WORLD.

INSTRUCTOR

DATE 26 27 April '86.

HAS ENGAGED IN A TWO-WAY AMATEUR RADIO COMMUNICATION (QSO) WITH STATION ______, LOCATED IN ______ AT THE SPECIAL EVENT AMATEUR RADIO STATION KA1SM ON 26 27 April'86.

MODE

BAND

CONTROL OPERATOR

IF YOU WISH MORE INFORMATION ABOUT BECOMING A LICENSED AMATEUR RADIO OPERATOR, WRITE TO:

AMATEUR RADIO/SCIENCE MUSEUM
P. O. BOX 116
NEWTON HIGHLANDS, MA 02161

Fig. 3. Certificate of participation.

WE SHIP WORLDWIDE

Barry Electronics Corp.

WORLD WIDE AMATEUR RADIO SINCE 1950

Your one source for all Radio Equipment!

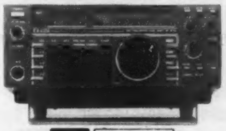
For the best buys in town call:
212-925-7000
Los Precios Mas Bajos en
Nueva York . . .

MAY We Help You With the Best in Commercial and Amateur Radios? Jan KB2RV, Toni, Kitty WA2BAP, Mark K2CON

See You at Operation Sail, July 3rd-5th, NY Harbor
See You at Mt. Beacon Hamfest July 12th

KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.
Saturday & Sunday 10 to 5 P.M.
Monday-Friday 9 to 6:30 PM Thurs. to 8 PM
Come to Barry's for the best buys in town.

ONV Safety belts-in stock



ICOM

IC-R71A, 751A, 745, 28A/H, 37A, 48A, R-7000, 1271A, 271A/H, 3200A,471A/H,735

YAESU

FT-767GX, FT-980, FT-757GXII, FRG-8800
FT-726, FRG-9600, FT-270/77ORH, FT-2700RH

SMART PATCH

CES-Simplex Autopatch 510-SA Will Patch FM Transceiver To Your Telephone Great For Telephone Calls From Mobile To Base. Simple To Use - $319.95.

PRIVATE PATCH III in stock

Budwick ANT. Products

FLUKE 77 Multimeter

KENWOOD

TS440S/AT, R-1000, R-2000, TS-940 S/AT
TM-201B, TR26/3600A , TM2570A/50A/30A
TR-751A Kenwood Service/Repair
TH21/31/41AT, TM-211A/
411A & TS-711A/811A
TM-3530A

COMPU-FIRE EXTINGUISHERS
EXL-5000E RTTY/AMTOR TERMINAL

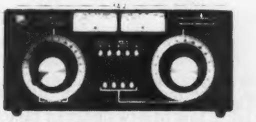
Antennas
A-S
Cushcraft
Hy-Gain
Hustler
KLM
METZ
Mini-Products
Mosley

YAESU
FT-1/2/703R
FT-2/709R/H
FT-1903/1123

ICOM
IC2AT/12AT
ICO2AT
IC-04AT
IC-A2/U16

Land-Mobile H/T
Midland/Standard
Wilson Maxon
Yaesu FTC-2203, FT-4703
Icom IC-M12 (Marine) M700
Tempo M-1

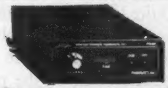
Alinco Power Supplies



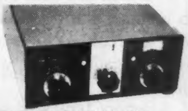
Nye MBV-A 3 Kilowatt Tuner

VoCom/Mirage/Daiwa Tokyo Hy-Power Amplifiers & 5/8λHT Gain Antennas IN STOCK

AMERITRON AMPLIFIER AUTHORIZED DEALER



SANTEC
ST-222/UP
ST-20T
ST-442/UP
HT-7



Yaesu FTR-2410, Wilson
ICOM IC-RP 3010 (440 MHz)
ICOM IC-RP 1210 (1.2 GHz)

MFJ Models 422, 313, 989B, & 941D

MURCH Model 2000 A, A-LS, B in stock

Soldering Station, 48 Watts, $68

JBC soldering line in stock.
MICROLOG-ART 1, Air Disk, SWL, Morse Coach

Computer Interfaces stocked: MFJ-1224
AEA CP-1, PK-80, DR.DX
CP-100, PK-64, Dr. QSO,
PK-232, PM-1

ETO

ALPHA AMPLIFIERS

KANTRONICS
UTU, Interface II, UTU-XT, Challenger, Packet Comm. II

Complete Butternut Antenna Inventory In Stock!

SANGEAN Portable Shortwave Radios

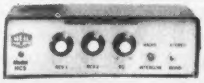
EIMAC
3-500Z
572B, 6JS6C
12BY7A &
4-400A

BIRD Wattmeters & Elements In Stock

DIGITAL FREQUENCY COUNTERS

Trionyx-	Pro-Com Engineering	
Model TR-1000	0–1 GHz	1200HH
0–600 MHz	0–1.3 GHz	1296HH

Long-range Wireless Telephone for export in stock

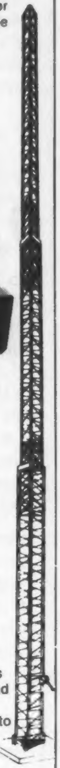


HEIL EQUIPMENT IN STOCK

BENCHER PADDLES, BALUNS, AUDIO FILTERS, IN STOCK

MIRAGE AMPLIFIERS
ASTRON POWER SUPPLIES
Saxton Wire & Cable

New TEN-TEC
2591HT, Corsair II, Argosy II, Century 22, 2510 RX-325



Tri-Ex Towers

Hy-Gain Towers & Antennas, and Roters will be shipped direct to you FREE of shipping cost.

AEA 144 MHz
AEA 220 MHz
AEA 440 MHz
ANTENNAS

MAIL ALL ORDERS TO BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012.

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"

BARRY INTERNATIONAL TELEX 12-7670
MERCHANDISE TAKEN ON CONSIGNMENT FOR TOP PRICES
Monday-Friday 9 A.M. to 6:30 P.M. Thursday to 8 P.M.
Saturday & Sunday 10 A.M. to 5 P.M. (Free Parking)
AUTHORIZED DISTS. MCKAY DYMEK FOR SHORTWAVE ANTENNAS & RECEIVERS.

Subways: IRT/LEX-"Spring St. Station"
BMT-"Prince St. Station"
IND-"F" Train-Bwy. Station"
Bus: Broadway #6 to Spring St.
Path—9th St./6th Ave. Station.

Commercial Equipment Stocked: ICOM, MAXON, Midland, Standard, Wilson, Yaesu. We serve municipalities, businesses, Civil Defense, etc. Portables, mobiles, bases, repeaters . . .

Experienced HELP WANTED Young or Old

We Stock: AEA, ARRL, Alpha, Ameco, Antenna Specialists, Astatic, Astron, B & K, B & W, Bencher, Bird, Butternut, CDE, CES, Collins, Communications Spec. Connectors, Covercraft, Cushcraft, Daiwa, Dentron, Digimax, Drake, ETO (Alpha), Eimac, Encomm, HeilSound, Henry, Hustler (Newtronics), Hy-Gain, Icom, KLM, Kantronics, Larsen, MCM (Daiwa), MFJ, J.W. Miller, Mini-Products, Mirage, Newtronics, Nye Viking, Palomar, RF Products, Radio Amateur Callbook, Rockwell Collins, Saxton, Shure, Telex, Tempo, Ten-Tec, Tokyo Hi Power, Trionyx TUBES, W2AU, Waber, Wilson, Yaesu Ham and Commercial Radios, Vocom, Vibroplex, Curtis, Tri-Ex, Wacom Duplexers, Repeaters, Phelps Dodge, Fanon Intercoms, Scanners, Crystals, Radio Publications.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
DEALER INQUIRIES INVITED. PHONE IN YOUR ORDER & BE REIMBURSED.
COMMERCIAL RADIOS stocked & serviced on premises.
Amateur Radio Courses Given On Our Premises, Call
Export Orders Shipped Immediately. TELEX 12-7670 ✓41

ALL SALES FINAL

Marc Stern N1BLH
c/o 73

Publish or Perish

Does a great club mean a great newsletter, or is it the other way around? N1BLH, a man with ink in his veins, helps you resuscitate your rag.

One of the most important offices in any club is that of newsletter or bulletin editor. That task provides the glue that binds a club together during the month. Like completing a circuit, a club's monthly newsletter provides a path through which the news and notices flow.

Newsletters typically range from professionally typeset, printed, and bound publications to one-page sheets that are hastily run off at the corner copy shop. Unfortunately, there are far too many of the latter across the spectrum of radio clubs and far too few of the former.

Usually, the more professionally done newsletters are found in clubs that not only have an active membership, but that are also exciting. These clubs have a dynamism and energy that spreads from the youngest member to the oldest operator. Quite likely, these clubs also have active class programs that encourage new operators to enter the hobby, as well as active social, educational, and operating calendars to keep everyone interested.

This isn't to say those clubs with one- or two-page newsletters may not be equally active and exciting. What they probably lack is the funding to handle the printing, which can easily run over $1,000 per year for a 100-member club with 11 or 12 newsletters.

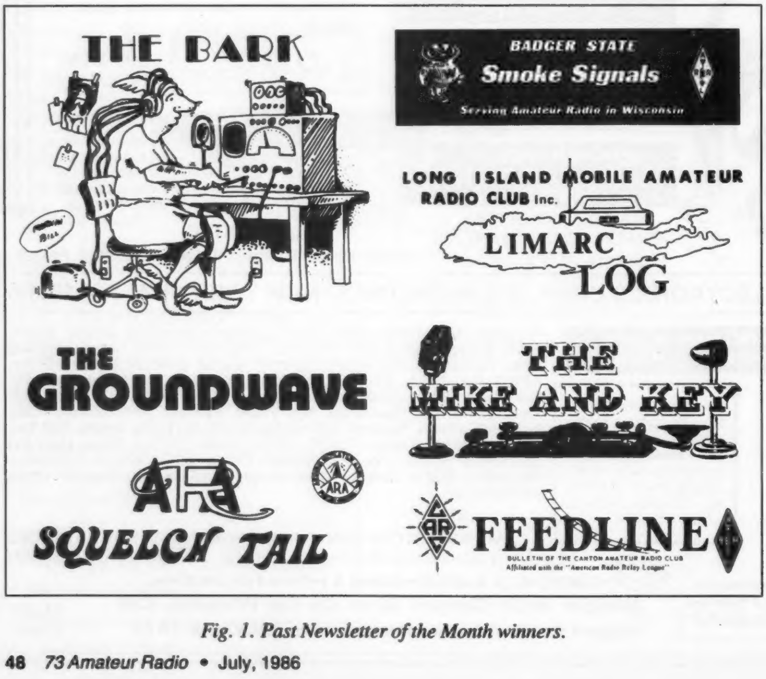

THE BARK
BADGER STATE
Smoke Signals
Serving Amateur Radio in Wisconsin
LONG ISLAND MOBILE AMATEUR RADIO CLUB Inc.
LIMARC
LOG
THE GROUNDWAVE
THE MIKE AND KEY
ARA
SQUELCH TAIL
FEEDLINE
BULLETIN OF THE CANTON AMATEUR RADIO CLUB
Affiliated with the "American Radio Relay League"

Fig. 1. Past Newsletter of the Month winners.

Still, it's unlikely that clubs that hastily print one-page, poorly typeset and reproduced newsletters are very active. Quite likely, the president not only heads the club but also writes the newsletter; takes the minutes; handles correspondence; finds speakers, films, or activities; as well as types up the mailing labels and licks the stamps. It's a one-man show that has fallen on his shoulders by default. All it takes is one volunteer, the editor, to begin changing this picture, and the newsletter is off the ground.

However, while volunteers can make a great deal of difference, another key ingredient to a successful newsletter is the willingness to fund the cost of production. Unless someone in your club owns a print shop or knows someone who does—an ideal situation—the chances are good that you'll find you have a monthly cash outlay, which a club can't be afraid to make. Since the newsletter is the most visible part of the club to many hams and community leaders—if they are included on the mailing list, which they should be because it's just good public relations—and since it is also the primary news medium for members and potential members of the club, it pays to do the best job your club can afford.

If, for example, you can afford professional printing but not photo work, then don't use photos. Retain the professional printing, however; it lends a finished look to the publication.

The most important ingredient after the editor and funding is support. Since the newsletter is the club's mouthpiece—not the editor's private soapbox or the executive board's private opinion sheet—the editor must encourage club input. In many cases this is like pulling teeth from the proverbial chicken, but it still has to be done.

For example, in the club where I am newsletter editor—the Framingham (Massachusetts) Amateur Radio Association—I have encouraged members to submit whatever they want to submit, and I've had a fair degree of success. Recently, a couple of our women members asked if they could have some recipes published and I said, "Why not?" Yes, it did raise hackles, but it shows the type of latitude we try to allow in the newsletter.

At other times, I've had people come forward with long lists of DX operations and beacons and we've published those, too. In fact, there have been some months where I've had so much material, I've had to hold some until the next month.

I just wish that were the case all the time, but like most editors I've found that it isn't. Much of the time, I'll write just about everything in the newsletter except the minutes of last month's meeting, repeater notes, and a listing of local flea markets, exams, and special events. These are provided for me.

> ***". . . the bottom line is knowing a job is done correctly and to the best of your ability."***

And this brings us to another consideration: format. Before the final printing, it's a good idea to experiment with format on a dummy issue. If many of your club members are older operators, then it makes sense to use larger type so that it's easier for them to read. Likewise, it also makes sense to print text in page format rather than in columnar format, which can be somewhat harder for older operators to read.

On the other hand, if most of your members are on the younger side, then experiment. Try various type sizes and styles to give your newsletter a unique flavor.

For example, the newsletter of the Nashua (New Hampshire) Area Radio Club, which I see as part of our newsletter exchange, has a professional appearance. Not only is it printed in two-column format, but the type style is clean and readable. Also, the club includes photos, which gives its newsletter a professional feel. Besides, it's apparent from the photos that the membership is active and supports not only its club, but also its newsletter.

Another unique newsletter I have seen is that of the Wellesley (Massachusetts) Amateur Radio Society. WARS makes effective use of two-column format and graphic and shaded headlines to create a very pleasant newsletter. The writing is light and the typesetting good, setting this newsletter apart.

Looking at the other side of the coin, I have seen newsletters that are little more than mimeographed or photocopied one-page throwaways that do little more than announce the meeting and the meeting site. They aren't too informative and look so amateurish that you have to wonder about the quality of the club. The print quality is also usually poor because a wide-matrix dot-matrix computer printer has been used, making everything look shoddily prepared.

With the editor found, funding and support assured, and format determined, there's little more for the editor to do except put the newsletter together, right? The answer, unfortunately, is wrong because there's still more to do, as WA1UEH, our newsletter's former editor for seven years, can attest.

Even though we have seen it is possible to establish a moderately continuous flow of material, it requires an editor's vigilance to ensure that this material will keep on flowing. For the most part, a simple phone call gets it in on time.

This information-gathering process has been greatly enhanced by the arrival of the personal computer in the ham shack. Although I use mine for business purposes, I also use it in the hobby, as well as for correspondence. The same is true of other club members, several of whom also contribute material to the newsletter. We can do this because our machines are equipped with modems, which makes it easy for them to zip information to me. All they have to do is dial my home phone; the computer answers, and the information is transferred.

In this manner, we can update the newsletter until the last minute before it is transferred to the club president's—KB1EW—machine. He prints it out and has it printed for us. As

FILL 'ER UP

OK, so you've decided to really improve the old newsletter, and now comes the question of exactly what it is you're going to fill those brilliantly designed, professionally produced pages with. Somewhere in this world, there must be someone who enjoys reading the minutes of last month's meeting. We at *73* have never met the man.

People

As much as we like to talk about rigs, antennas, and the weather, the most interesting subject in ham radio is *people.* "Fred made a new antenna out of his old Nash Rambler. Bob tried to put up a dipole with a bow and arrow, hit a sea gull, and hasn't seen the antenna since. Crazy Larry fell off his tower again—he's got an HT in the hospital with him and he'd love to hear from you." The one thing people never get tired of reading about is themselves.

Activities

Your newsletter is your chance to light a fire under your club. An "active" club isn't one that just has regular meetings. Activate your club by selling the members on a pilgrimage to Dayton, or a barbeque in your backyard, or something. A newsletter that deals strictly in reporting what has happened in the past will be *boring.* Inject the future into your publication. "Field Day is going to be bigger than ever this year, that is, if you folks will just get going. We've had 27 people volunteer to help dispense the beer, but we could really use some help getting a Novice station set up." Production schedules and delays do have a way of turning your "future" writings into the history by the time the newsletter comes out, but at least you'll be closer than you were before.

Plagiarism

We at *73* do not care which of the other three ham magazines you plagiarize. But seriously, folks, if you see something in *73* that would be of use in your newsletter, write us a letter and tell us what you want to do. Chances are, unless you're trying to make a buck off the deal, we'll give you the OK. N1BLH tells you exactly where to look for the rest of your news—there's always lots of material; you just have to know where to look.

Art

Someone in your club has enough artistic skill to draw up a clever logo. Find him or her. It's true that you can't tell a book by its cover, but it's also true that your great information will be ignored if it looks ugly. Illustrations and cartoons break up the text and make for easier reading. Somebody in your club must think that he's funny enough to do a monthly cartoon. Give him a chance.

First Class

It takes only slightly more effort to put out a first-class publication than it does to put out a boring rag. The editor who has had the job dumped on him and who is given no help in the endeavor is unlikely to make the extra effort—he's also unlikely to be editor for very long. With a little help from *you,* your club's newsletter will be something people look forward to receiving each month. Without your help: "The June meeting was opened and the minutes of the May meeting were approved. Don Dirge brought up the subject of whether or not to move the club repeater, which is currently not working anyway because Bill Bore forgot to. . . ."

NEWSLETTER OF THE MONTH

Every month, *73*'s editorial staff sifts through the hundreds of newsletters that we receive, searching for one that stands out from the crowd. If you'd like to enter your club's publication in *73*'s Newsletter of the Month Contest, send it to *73* Magazine, WGE Center, Peterborough NH 03458, Attn. Newsletter of the Month.

you can see, there's very little paper that changes hands today, other than in the initial information-input process.

Even with this automation, there are months in which all the persuasion and reminding in the world doesn't produce much copy. In those months you must turn to your alternate sources of information—other club bulletins, ham radio newsletters, and organizations such as the Amateur Radio News Service.

From other club bulletins, you can usually extract local information about which club is doing what and where local classes and flea markets are being planned or held. Generally, you'll find that between your own input and local bulletins, you may be able to fill half the newsletter.

Your next source of information, then, comes from newsletters such as the *W5YI Report* and *ARRL Letter*. They provide up-to-date information on matters of crucial interest. In fact, many of the newsletters I see make liberal use of the information contained in these and other professionally produced newsletters. The only proviso in using this information is crediting the newsletter that originally contained it.

Likewise, the Amateur Radio News Service is an important source of input from across the country. Made up by several hundred bulletin editors, the *ARNS Bulletin* provides you with lighthearted material and cartoon fillers, as well as some serious editorials. You can use this information, provided you credit ARNS. ARNS is a separate group whose dues are $5 a year, but it's money well spent as I have found.

Finally, if you can do it—and if your budget allows it—try to use as many photos as you can. Not only does this create interest in the newsletter, but it also creates excitement in the club, which, after all, is the bottom line of any newsletter effort.

With all of this done, the mundane work is next: folding, labeling, and stamping. If you have several people on your committee, this can go quite quickly. However, most of the time you'll find that you're doing this yourself. Relax, though; it doesn't take too much time and, if the labels are computer generated, it will be little effort to label, stamp, and mail them. In fact, if no one in your club can generate computerized mailing labels, it might be a good idea for your club to invest in having several sets of labels printed. In the long run, it will save time and effort.

When all is said and done, though, the bottom line in the newsletter is satisfaction—the satisfaction that comes with knowing a job is done correctly and to the best of your ability. Don't think that as editor you'll find people rushing up to you month after month to pat you on the back for the fine job you're doing—because they won't. To the long-suffering editor, those comments seem few and far between. But don't think the club doesn't appreciate the job you are doing, either—because it does. It's just that when a newsletter is running well and arrives on time every month, people take it for granted.

In a way, though, having people take the newsletter and its quality for granted is the ultimate compliment. It means they're satisfied with the work you are doing and with the newsletter as a whole. In fact, this type of quiet is reassuring because, as editor, you soon realize that if you blow something, you'll hear about it loud and long. Now, isn't the quiet better? You bet it is, and it means your newsletter's a hit.

So, if you have the right formula, you've got it made. Your newsletter may never win national awards, but it serves its purpose and informs. What more can you ask?■

the HAM STATION
P.O. Box 4405
220 N. Fulton Ave.
Evansville, IN 47710
Store Hours
MON-FRI 9AM-6PM
SAT 9AM-3PM

WARRANTY SERVICE CENTER FOR:
ICOM. YAESU. TEN-TEC

TERMS:
Prices Do Not Include Shipping.
Price and Availability Subject to Change Without Notice
UPS COD $2.50 Per Package

MOST ORDERS SHIPPED SAME DAY

YAESU
10 Memories
45 Watts
With FTS-8
ORDER NOW
FT270R

ICOM
•25 watts
•large LCD readout
•wideband coverage
•21 memory channels
NEW!
IC-28A
2 Meter Mobile
Ham Net $419.00 Call for Special Introductory Price

TENTEC
2510 Mode B
Satellite Station

WELZ
Lots of Welz Meters in Stock
Call for Special Pricing and Details
Welz Meters

ICOM
•all modes built in
•QSK up to 40 wpm
•built-in 500 Hz CW filter
•electronic keyer included
•100% duty cycle
NEW!
IC-751A
HF Transceiver
Ham Net $1499.00 Call for Special Introductory Price

YAESU
YAESU FT209RH
5 watts
Free FTS-6
10 Memories
CALL FOR YOUR SPECIAL PRICE

AEA • ARRL • ALINCO • ALLIANCE • ALPHA DELTA • AMECO • AMERITRON • ANTENNA SPECIALISTS • ASTRON • B&W • BENCHER • BUTTERNUT • CSI • CALLBOOK • COMMUNICATION SPECIALISTS • CUSHCRAFT • DAIWA • DATASCAN • HEIL • HUSTLER • HYGAIN • ICOM • KDK • KLM • KANTRONICS • KEN PRO • LARSEN • MFJ • MICROLOG • MIRAGE • NYE • ROHN • SANTEC•SHURE • TEN TEC • TOKYO HY-POWER • UNADILLA • VALOR • VIBROPLEX • WELZ • YAESU

ORDERS AND PRICE CHECKS ONLY, PLEASE 1-800-523-7731
INFORMATION AND INDIANA 812-422-0231
SERVICE DEPT. 812-422-0252

the HAM STATION

ASTRON CORPORATION

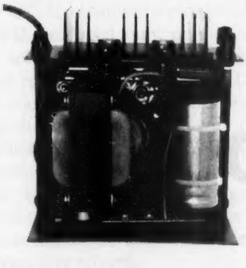
9 Autry
Irvine, CA 92718
(714) 458-7277

16

Canadian Distributor
Eastcom Industries, Ltd.
430 Signet Dr.
Weston, Ontario, Canada M9L2T6
(416) 743-7801

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •



INSIDE VIEW — RS-12A

RS and VS SERIES SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output.
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-4A.
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage.
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105 - 125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE: Less than 5mv peak to peak (full load & low line)

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM-A Series

MODEL RM-35A

19" X 5¼ RACK MOUNT POWER SUPPLIES

Model	Continuous Duty (AMPS)	ICS* (AMPS)	Size (IN) HXWXD	Shipping Wt. (lbs.)
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50

- SEPARATE VOLT & AMP METERS

Model	Continuous Duty (AMPS)	ICS* (AMPS)	Size (IN) HXWXD	Shipping Wt. (lbs.)
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W X D	Shipping Wt (lbs)
RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

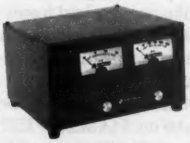
RS-M SERIES

MODEL RS-35M

- Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4½ x 8 x 9	13
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

VS-M SERIES

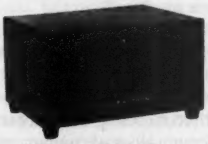


MODEL VS-20M

- Seperate Volt and Amp Meters
- Output Voltage adjustable from 2-15 volts
- Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES



MODEL RS-12S

- Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7½ x 10¾	10
RS-10S	7.5	10	4 x 7½ x 10¾	12
RS-10L(For LTR)	7.5	10	4 × 9 × 13	13
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

Richard Phenix
73 Staff

Genius Brings Home The Bacon

. . . and hogs the spotlight.

It has been nearly seven years now since the truncated success of my home-brew Mobius-twist, All-purpose, Synergistic, Lumped-constant circuit, Hanger-hung, Folded dipole, Phase-velocity, Transcalent-transceive System (MASLHFPTS™)—the Mark 1 version of which, you may remember, blew up Con Edison generators in New York City in 1965, extinguishing lights all along the East Coast. (That's what truncated the success, of course—for the first truncation, that is. Since I hadn't remembered to fuse the rig, it blew up, too.)

No, I will NOT apologize again! Hoo, boy! Some soreheads never forget the smallest inconveniences! And if Missouri hadn't run out of mules. . . well, that's what brought about the final truncation: not enough mules. Only a couple more years of mule-kicking of components into random configurations (see Fig. 1) and the single-sided-band MASLHFPTS™ circuit, whatever it was, could have been reconstructed. Then, not only would those power-outage complaints have been drowned out by roars of public acclaim for the new rig, but I'd have been a multimillionaire.

Anyway, it's been so many years that it is time once again to stimulate readers of *73* with news of another promising field for basic research, experimentation, and homebrewing. This time mules will not be required. The main reason I called for them before was to help out a friend of mine who ran a mule farm near Neosho, Missouri; he needed the new business. HE was the one who became a millionaire. He moved to Norway. "I'd always wanted to live in Norway," he wrote me, "but until your hundreds of hams bought all my mules, I couldn't afjord to." (He never could spell.)

As so often is the case with pure researchers—I mean, when one is engaged in pure research—I discovered this new field serendipitously as a by-product of my continuing efforts to discover how my Mobius-twist antenna and the Adjustment Circuit Box had brought in signals from Mars *in color* when the basic module of my rig was an old black & white TV set. (See "Einstein Was Wrong" in the October, 1979, issue of *73* if you want to see how all this got started.) I had used up my last mule and was reduced to doing my own kicking; I was just about to quit (my foot was really sore) when I was overwhelmed by that same courageous determination which in my teens had made it possible for me to locate WOR, WJZ, and so on, on the family wireless nearly every time I tried! I just had to make one more effort!

> ***". . . I had a date with a gorgeous broad in Boston in a few days, a zoftig, blue-eyed blonde . . ."***

I did so, waited for the solder to cool, plugged the new circuit into the Adjustment Circuit Box, and disappeared.

The Mark 1 PIGS

When I say I disappeared, I mean that that's the way it would have looked to you if you had been there watching me—I'm not suggesting any of that weirdo science fiction stuff that nobody but a congenital idiot would believe. I was still visible, for heaven's sake, I could still see myself perfectly well; all that had happened was that I wasn't in my QTH anymore! I was out in my antenna field, under a 70-foot tower that hadn't been there an hour before. An hour before I had seen it where the truck had delivered it, lying flat on the floor of my barn, in sections, ready for a tower-raising party scheduled for the next day!

It didn't take long for me to think this thing through and realize that something strange had happened. I mean, I have had lots of experiences and I know a strange experience when I see one. And I did what I had learned to do: I stood perfectly still and pondered the matter. Not necessarily in this order, these were my conclusions:

1) The strangeness was of a different order from those which hams all over the world had reported to me, resulting from their own mule-kick efforts to reconstruct the MASLHFPTS™. There was the XT in Africa who turned light blue all over (he became a very successful witch doctor; I get all my potions from him, now); there was the 4K1 who used his strange result to heat his QTH, but he couldn't turn it off, and his last transmission came from a depth of approximately 7,000 feet under the ice cap; and, of course, there was the VO1 whose circuit sent out a subsonic whistle. I'm not sure I believe him, but he was there and I wasn't. If he says that this whistle, being slower than sound, piled up around him like transparent whipped cream snaking out of a pressurized can, and that it pierced both eardrums before he realized what had happened and kicked the rig into silence, well, maybe. . . .

2) It wasn't a one-dimensioned strangeness as in those examples. In this case, both time and space seemed to have been involved, even if only modestly. The distance from my QTH to the now-erected tower wasn't much over 100 feet, and the loose, moist dirt near the tower guy anchors obviously was only hours old.

3) I couldn't stand there forever.

4) Maybe my MASLHFPTS™ was going to be an oxymoron! That is, maybe I was about to turn a failure into a successful failure of some kind. Could I have discovered (invented) a time machine?

Well, hoo, boy! It sure looked it!

All of that happened last summer. During the winter of 1985/86, I did all the tedious analysis the situation called for—disconnecting and reconnecting components, substituting different values of components, rearrang-

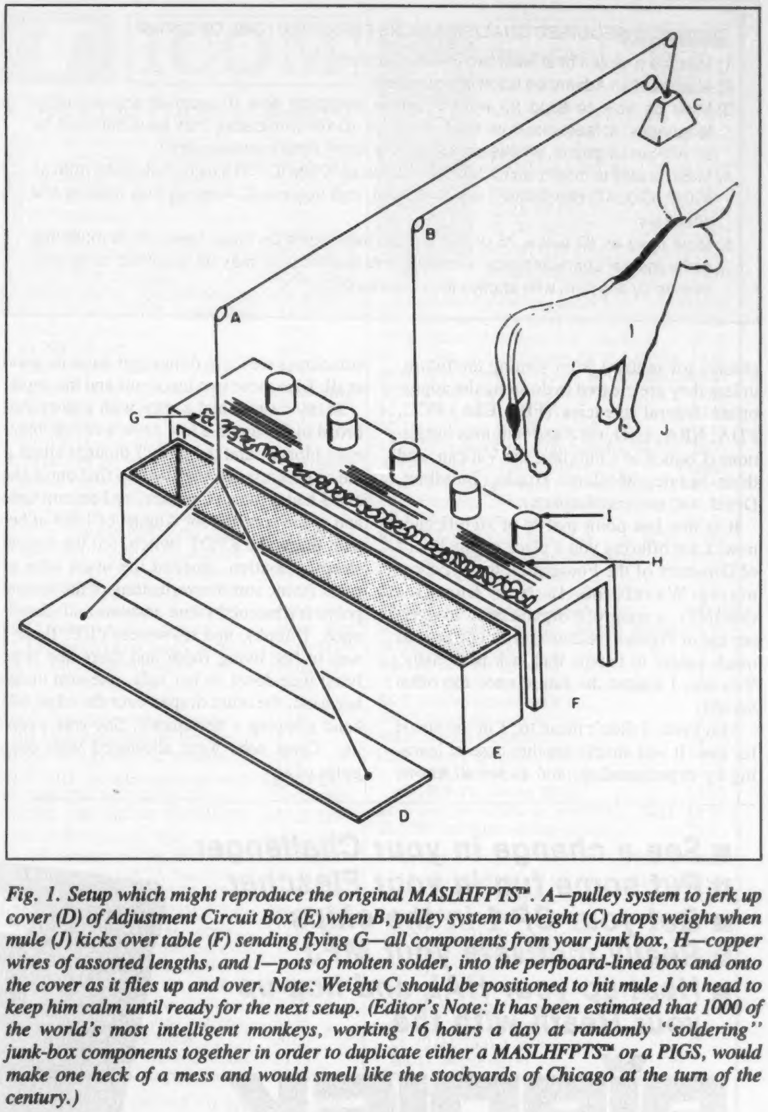


Fig. 1. Setup which might reproduce the original MASLHFPTS™. A—pulley system to jerk up cover (D) of Adjustment Circuit Box (E) when B, pulley system to weight (C) drops weight when mule (J) kicks over table (F) sending flying G—all components from your junk box, H—copper wires of assorted lengths, and I—pots of molten solder, into the perfboard-lined box and onto the cover as it flies up and over. Note: Weight C should be positioned to hit mule J on head to keep him calm until ready for the next setup. (Editor's Note: It has been estimated that 1000 of the world's most intelligent monkeys, working 16 hours a day at randomly "soldering" junk-box components together in order to duplicate either a MASLHFPTS™ or a PIGS, would make one heck of a mess and would smell like the stockyards of Chicago at the turn of the century.)

ing components, etc. I found early on that values had nothing to do with results. The 1000-Ohm trimpot did (or didn't do) exactly as much as a 1-Ohm job; 330 uF/30 V meant as much (or as little) to the whole circuit as 3 pF/30 mV. Even substituting a 2N2222 for an MPF102 produced only minor variations. What seemed to be the determining factor was the relative positioning of the 15 components which had hit the perfboard when I kicked the table (and, of course, which had encountered hot solder while in flight and had thus formed into a circuit).

This was fortunate indeed—a great time-saver! It takes only 12,440 millenia to try out all the permutations for 15 variables (testing one every five minutes).

Ah, you spotted something contradictory there right away, didn't you! Can't fool a ham! So you probably have figured out how I coped with the dilemma. Yup. I calibrated my time/space machine along the time continuum first, and as soon as that was under control, I merely went back to the year 12,438,015 B.C., planning to work right through to 1986 A.D.

There were some problems! Not with aging—my metabolism stayed in neutral all the time I was in either the past or the future—but it was pure luck that I survived that trip back to what I figured out later was the Miocene Age. No sooner did I ever settle down to work when some lousy volcano would errupt and I'd have to flee. Between volcanoes there were earthquakes, and all the time those pesky ramapithecines and sivapithecines (early orangutans) kibitzed around with me. Let me tell you, this planet was no place to be in the old days!

So, I simply sliced up the time span into 59,238 segments and visited 1776 America 59,238 times for 210 years at a crack. It was fascinating to watch the shaping up of the United States, and hoo, boy! are our history books full of lies! Abe Lincoln, for example. . . but that's another story. Anyway, that's how I completed the analysis job.

Oh, yes. The name of my time machine. You know about IGSs (inertial guidance systems); all the best submarines have them, for example. An IGS tells the man steering his submarine where he is. Well, it struck me (literally, as I'll explain below) that a POSITIVE inertial guidance system (PIGS) would be one which didn't just lay there, it DID something, so my pet name for the machine became Pigasus (you know, the flying hog). The full name under which I'll register the trademark is the scientific one, of course: Positive Inertial Guidance System In Synergistic Plasmoidal Advectionated Cosmic Energy (PIGSinSPACE). (There is a luminous glow around the machine when in transit.)

The name came from literally being struck since it was in my mind when I recovered consciousness following one of the earliest attempts to calibrate the machine along the space continuum. It seems that there is an interaction between the two dimensions: The time setting has to be adjusted in the context of the setting for the space to be traversed. The shorter the distance the more the time setting has to be reduced to compensate for some sort of warp.

I had set the space control to take me to the office of a friend of mine in downtown Peterborough, and I set the time control for seven days in the past (when I knew he had been out of town—I wasn't ready to show him my machine). Well, his office is on the second floor of a building put up three years ago, and I arrived there four years ago and had one helluva fall through the branches of a pine tree, which knocked me silly. See what I mean?

Your Job, Should You Accept This Mission . . .

For reasons I'll share with you in a moment, I'm offering all of you readers who qualify a piece of the action (see box). It would be totally irresponsible either to market Pigasus in its present form (my Mark 1937945H model) or sell seats on it for trips to anytime. Not only should there be considerably more testing, but there are safety devices which need perfecting to avoid damage to riders at various stages. Cases in point:

1) An antigrav module to be plugged in whenever there is a likelihood that you could arrive in midair somewhen.

2) Drift prevention for the time and space settings. It is both physically and mentally painful to find yourself occupying two spaces at the same time even when they are only molecules apart—or worse, also at two points in time, even when separated only by nanoseconds. The sensation resembles that of being stretched on a Middle Ages torture rack between two high-fidelity speakers at full gain, both belting out "You're Nothin' But A Hound Dog," with one speaker equipped with a split-second time-delay circuit.

3) A governor is needed to prevent pur-

REQUIRED QUALIFICATIONS FOR DIRECTORS OF SWINE

1) Must be a citizen of at least two DXCC countries.
2) Must hold an Advanced ticket or equivalent.
3) Must be able to send 50 wpm in native language and 10 wpm in any ten other languages, at least one from each continent. (Drum proficiency may be substituted for an African language, smoke signaling for a North American language).
4) Must be able to modify an ICOM IC-27A to be an ICOM IC-751A using only parts from an ICOM IC-02AT, blindfolded, in a high wind, at 0 degrees C, wearing only mittens and sneakers.
5) Must have an IQ below 75 or above 150. Individuals on those levels have much the same mental characteristics. (Actually, this qualification may be assumed to be possessed by any ham who applies for a directorship.)

chasers (or renters) from visiting the future, unless they are cleared to do so by the appropriate federal agencies (FBI, CIA, FCC, FDA, NRA, LSD, etc.) and religious institutions (Council of Churches, the Vatican, and their Judaic, Moslem, Hindu, Buddhist, Druid, and etc. counterparts).

It is this last point that is of significance now: I am offering you a place on the Board of Directors of the Foundation for Synchronizing Waveforms In New Energies (SWINE), a nonprofit organization to oversee use of Pigasus, because I won't be around much longer to handle that task personally. You see, I visited the future once too often myself.

Mind you, I didn't mean to; I'm too smart for that. It was simply another case of learning by experimenting, and as we all know, sometimes we learn things that do us no good at all. Like those two innocents and the apple.

In my case, I had a date with a gorgeous broad in Boston in a few days, a zoftig, blue-eyed blonde, and the more I thought about it the more I just couldn't wait to find out if she and I had a future together, so I set my time and space controls for August of 1989 at her pad, threw the KPDT switch, felt the typical sleepy sensation, smelled the usual attar of roses (some sort of overheating of the special polytetrafluoroethylene insulation I developed, I think), and ttwweeeeeYUP, there I was in her living room and there she was: lying face down on her sofa, one arm under her head, the other draped over the edge, her hand gripping a newspaper. She was weeping. Great sobs were alternated with deep gulps of air....

Clearly there had been something in the paper—and I tiptoed over, craned my neck, and was able to read black headlines: a three-column spread on the right-hand side, and a subhead:

N.H. MAN DIES HEROICALLY

SAVING CHILD IN CHARLES RIVER

President Dianne Ritson

Establishes Federal Holiday

in Memory of Richard Phenix

I Pigasused back to Peterborough. I dunno. Maybe I should have checked the date on the paper...maybe I had been clumsy making the time setting...maybe it had been 1999 or something. I mean, Dianne is still Art Director for *73*, and so far nobody has even guessed that she has political ambitions....

Well, I found out that my zoftig, blue-eyed blonde and I did have *something* of a future (another damn oxymoron: another truncation: a futureless future). I mean, I was being cried over, wasn't I? Something must have transpired that she thought she was going to miss...unless my money.... No. Couldn't be that. I have only a couple of million in the bank.

Anyway, that's why NOW is the time for all you hams out there to apply for seats on the Board of Directors. ■

■ *See a change in your Challenger*
■ *Put some fun in your Flescher*
■ *Get your CP-1 in the chips*
■ *Really motivate your MFJ*
■ *Heat-up your HAL and hop-up your Heath with the....*

AIRDISK

AND AIR-ROM CARTRIDGE
For both the COMMODORE 64 and VIC 20
(Soon for the new C-128)

Works with all these fine terminal units to bring you the ultimate in RTTY/CW/AMTOR performance. New AMTOR + program with variable PTT delay for slower rigs and high rate bit sync to compensate for computer clock crystal variations. It's the best $39.95 you'll ever spend to improve your station. Don't have a disk drive, then use the ROM cartridge at $59.95. On performance and features vs. cost, nothing even comes close! No complicated menus to bog you down. No limited performance programs here. The AIRDISK will enhance any demodulator. Disk works with both computers. Specify which for cartridge.

AIR-ROM
MICROLOG
18713 Mooney Drive
Gaithersburg, MD 20879
AIR-ROM
MICRO

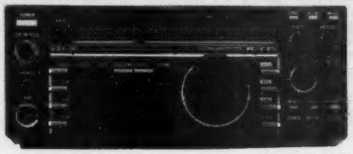
HERE ARE A FEW OF ITS MANY FEATURES:
• on screen tuning indicators • full or split-screen • auto-load memories* • output to commodore printers • full speed operation, morse to 99 wpm. Baudot to 132 wpm, ASCII to 300 Baud • 4 mode AMTOR • WRU • independent RX/TX normal/invert • pitch reference CW tuning • real-time disk communication* • break buffer • random code generator • RX/TX of basic programs* • 24 hr. clock • unshift or space • foxtest and more.
18713 Mooney Drive Gaithersburg, Md. 20879
301 258-8400
*Disk only

MICROLOG
INNOVATORS IN DIGITAL COMMUNICATION
✓70

Commodore and VIC 20—trademarks of Commodore Electronics. Copyright ©1985 MICROLOG CORPORATION

ICOM

Check the Prices at AES®!



HF Equipment	Regular	SALE
IC-735 HF transceiver/SW rcvr/mic	889.00	769^{95}
PS-55 External power supply	169.00	149^{95}
AT-150 Automatic antenna tuner	399.00	359^{95}
FL-32 500 Hz CW filter	59.50	
EX-243 Electronic keyer unit	50.00	
UT-30 Tone encoder	TBA	
IC-745 9-band xcvr w/.1-30 MHz rcvr	999.00	799^{95}
PS-35 Internal power supply	169.00	149^{95}
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-45 500 Hz CW filter (1st IF)	59.50	
FL-54 270 Hz CW filter (1st IF)	47.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89^{95}
FL-53A 250 Hz CW filter (2nd IF)	96.50	89^{95}
FL-44A SSB filter (2nd IF)	159.00	144^{95}
SM-6 Desk microphone	40.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	21.99	

IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	999^{00}
PS-35 Internal power supply	160.00	149^{95}
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89^{95}
FL-53A 250 Hz CW filter (2nd IF)	96.50	89^{95}
FL-33 AM filter	31.50	
FL-70 2.8 kHz wide SSB filter	46.50	
HM-12 Extra hand microphone	39.50	
SM-6 Desk microphone	40.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	21.99	

IC-720A 9-band xcvr ● **(CLOSEOUT)** ●	1349.00	689^{95}
PS-15 20A external power supply	149.00	134^{95}
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
BC-10A Memory back-up	8.50	
SM-5 8-pin electret desk mic	40.00	
MB-5 Mobile mount	21.99	

Other Accessories:	Regular	SALE
PS-15 20A external power supply	149.00	134^{95}
CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for CF-1/PS-15	6.50	
PS-30 Systems p/s w/cord, 6-pin plug	259.95	234^{95}
OPC Opt. cord, specify 2, 4 or 6-pin	10.00	
SP-3 External speaker	54.50	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal (745/751)	56.00	
PP-1 Speaker/patch (specify radio)	139.00	129^{95}
SM-8 Desk mic - two cables, Scan	69.95	
SM-10 Compressor/graph EQ, 8 pin mic	119.00	109^{95}
AT-100 100W 8-band auto. antenna tuner	399.00	359^{95}
AT-500 500W 9-band auto. antenna tuner	499.00	449^{95}

Other Accessories cont.	Regular	SALE
AH-2 8-band tuner w/mount & whip	549.00	489^{95}
AH-2A Antenna tuner system, only	429.00	389^{95}
GC-4 World clock ● **(CLOSEOUT)** ●	99.95	69^{95}
GC-5 World clock	79.95	

HF linear amplifier	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1795.00	1389

6-meter VHF Portable	Regular	SALE
IC-505 3/10W 6m SSB/CW portable	469.00	419^{95}
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	

VHF/UHF base multi-modes	Regular	SALE
IC-551D 80W 6-meter SSB/CW	735.00	649^{95}
EX-106 FM option	125.00	112^{95}
BC-10A Memory back-up	8.50	
IC-271A 25W 2m FM/SSB/CW	735.00	649^{95}
AG-20 Internal preamplifier	56.95	
IC-271H 100W 2m FM/SSB/CW	944.00	789^{95}
AG-25 Mast mounted preamplifier	84.95	
IC-471A 25W 430-450 SSB/CW/FM xcvr	839.00	729^{95}
AG-1 Mast mounted preamplifier	89.00	
IC-471H 75W 430-450 SSB/CW/FM	1149.00	989^{95}
AG-35 Mast mounted preamplifier	84.95	

Accessories common to 271A/H and 471A/H		
PS-25 Internal power supply for (A)	99.00	89^{95}
PS-35 Internal power supply for (H)	169.00	149^{95}
PS-15 External power supply	149.00	134^{95}
SM-6 Desk microphone	40.00	
EX-310 Voice synthesizer	41.25	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM, TTP mic	549.00	479^{95}
IC-490A 10W 430-440 SSB/FM/CW	649.00	569^{95}

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	389.00	349^{95}
IC-27H Compact 45W 2m FM w/TTP mic	429.00	379^{95}
IC-37A Compact 25W 220 FM, TTP mic	449.00	349^{95}
IC-47A Compact 25W 440 FM, TTP mic	489.00	429^{95}
PS-45 Compact 8A power supply	112.95	99^{95}
UT-16/EX-388 Voice synthesizer, 47A	31.00	
SP-10 Slim-line external speaker	31.95	
IC-3200A 25W 2m/440 FM w/TTP	569.00	469^{95}
UT-23 Voice synthesizer	31.00	
AH-32 2m/440 Dual Band antenna	32.95	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	
IC-1271A 10W 1.2 GHz SSB/CW Base	1049.00	929^{95}
PS-25 Internal power supply	99.00	89^{95}
EX-310 Voice synthesizer	41.25	
TV-1200 ATV interface unit	115.00	106^{95}
UT-15S CTCSS encoder/decoder	79.95	
IC-120 1W 1.2 GHz FM Mobile	499.00	449^{95}
ML-12 1.2 GHz 10W amplifier	339.00	299^{95}

Repeaters	Regular	SALE
RP-3010 440 MHz, 10W FM, xtal cont.	1049.00	949^{95}
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1259.00	1129
Cabinet for RP-1210 or 3010	269.00	

Hand-held Transceivers

Deluxe models	Regular	SALE
IC-02AT for 2m	369.00	299^{95}
IC-04AT for 440 MHz	399.00	339^{95}

Standard models	Regular	SALE
IC-2A for 2m	239.00	189^{95}
IC-2AT with TTP	269.50	209^{95}
IC-3AT 220 MHz, TTP	299.95	249^{95}
IC-4AT 440 MHz, TTP	299.95	249^{95}

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger for all batteries	74.95
BC-60 6-position gang charger, all batts **SALE**	349.95
BC-16U Wall charger for BP7/BP8	19.95
LC-11 Vinyl case	18.49
LC-14 Vinyl case for Dlx using BP-7/8	18.49
LC-02AT Leather case for Dlx models w/BP-7/8	39.95

Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	42.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	31.25
BP-4 Alkaline battery case	13.75
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	10.75
CP-10 Battery separation cable w/clip	19.99
DC-1 DC operation pak for standard models	18.75
EX-390 Bottom slide cap	4.95
MB-16D Mobile mtg. bkt for all HTs	21.99
LC-2AT Leather case for standard models	39.95
RB-1 Vinyl waterproof radio bag	30.00
HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	39.00
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 & Deluxe only	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier **SALE**	89.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100 kHz-30 MHz, 117V AC	$849.00	689^{95}
RC-11 Infrared remote controller	59.95	49^{95}
FL-32 500 Hz CW filter	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-44A SSB filter (2nd IF)	159.00	144^{95}
EX-257 FM unit	38.00	
EX-310 Voice synthesizer	41.25	
CR-64 High stability oscillator xtal	56.00	
SP-3 External speaker	54.50	
CK-70 (EX-299) 12V DC option	10.95	
MB-12 Mobile mount	21.99	
R-7000 25 MHz-2 gHz scanning rcvr	969.00	849^{95}
RC-12 Infrared remote controller	TBA	
Voice synthesizer	TBA	
AH-7000 Radiating antenna	89.95	(6)

HOURS ● Mon. thru Fri. 9-5:30; Sat. 9-3

Milwaukee **WATS** line: **1-800-558-0411** answered evenings until 8:00 pm Monday thru Thursday.

Please use WATS lines for Ordering

use Regular lines for other Info and Service dept.

All Prices in this list are subject to change without notice.

Order Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro Area)
1-800-242-5195.

AMATEUR ELECTRONIC SUPPLY® *Inc.*

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 • Phone (414) 442-4200

AES® BRANCH STORES

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio WATS 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave
Phone (305) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917

CLEARWATER, Fla. 33575
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227

Associate Store

CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside Illinois 1-800-621-5802

Arthur R. Lee WF6P
106 Western Court
Santa Cruz CA 95060

Administering the Novice Exam

Put back some of the pleasure you've taken from amateur radio—bring a Novice into the fold.

It is always nice to return something to the fraternity of ham radio, either because we like to help or because of a desire to repay the help someone unselfishly gave us. Many hams participate in emergency services, public-service communications, and the National Traffic System. Others hold ARRL district offices, are members or elected officers of local ham clubs, serve as volunteer examiners (VEs), or are Novice/upgrade instructors.

With so much to do in ham radio, one of the finer pleasures, I believe, is the training, testing, and licensing of new hams. Getting someone started on the road to the high adventure of ham radio is a rewarding experience for those who take the time to participate.

With the advent of the recent VE program, ham licensing is easier and quite a bit more convenient than it ever was. Not changed, however, is the Novice licensing program.

To get up on the first rung of ham radio, the candidate must acquire these minimum skills: sending and receiving Morse code at a speed of 5 words per minute, and the lowest level of knowledge pertaining to FCC rules, safety, simple operating procedures, and basic electrical principles. Before the ham aspirant can get on the air, that minimum amount of knowledge must be demonstrated in a test.

The written portion of the Novice exam is very plainly laid out in the widely available American Radio Relay League publication, "Tune In The World With Ham Radio" (complete with 5-wpm code tape, $10, ARRL Headquarters, Newington CT 06111). The questions and answers from the Novice examination pool are in the publication and can be mastered in a few evenings of reading. Separate copies of the question pool can be obtained from either any FCC Field Office or the ARRL at no cost.

Code practice is accomplished by listening to the accompanying ARRL tape or through the purchase of other tapes available through the advertising pages of the various ham magazines such as *73*, *QST*, or *CQ*. When the Novice candidate is ready for testing, he or she must find a General-class (or above) licensed amateur who will prepare and administer the Novice test. The candidate must have an FCC Form 610 (June 1984) or the examiner may request one from either the ARRL or the FCC (PO Box 1020, Gettysburg PA 17325). Candidates usually do not have or know how to obtain Form 610, so help may be needed.

> ***" 'How'd you do on the code test?' I asked. 'What test?' the candidate asked. 'The one you just took!' "***

In addition to being General class or above, test administrators must be 18 years of age or older, must not be related to the candidate, and must not have an interest in the manufacture or distribution of ham equipment. These restrictions mean that you cannot give the Novice exam to your wife or to a family member—a handicap, but a necessary one to prevent nepotism.

So, as a qualified Novice examiner, how does one give the test? It is quite simple. Utilize the Element 1A pool of 200 questions. This may be provided by the candidate or you may obtain your own. Ask for "PR Bulletin 1035-A."

The question pool has been subdivided into 20 blocks of 10 questions each. The applicant must answer one question from each of the blocks. The selection of the questions is up to the examiner. A passing grade is the correct answering of 15 or more questions.

The examiner may use any method of administering the test—including single answer, multiple choice, or essay type. He may conduct the test on an oral-interview basis or with a written form with a fill-in-the-blank or true/false format of his own construction.

The code test is administered prior to giving the written test. The examiner must determine that the candidate can receive code at the speed of 5 words per minute. This can be done by any method, usually by tape or key. The code may be sent for 5 minutes. I usually send plain conversational messages in the old format of name, callsign, QTH, RST, and weather report—as is normally encountered in the traditional opening lines of an initial contact. It doesn't matter what you send as long as the candidate can copy you.

Following the 5 minutes of sending, the examiner can ask 10 questions pertaining to the code text. The candidate must answer 7 of the 10 correctly to pass. As an alternative method, the examiner may ask for one minute of solid copy of a 5-minute string of random groups of characters. This means that the candidate must have at least five correct words in a row copied without error.

We must be fair to the candidate and

ourselves. There is nothing to be gained by passing a candidate if he really cannot copy code. We would be doing both the prospective ham and the ham community a great disservice. What we are really trying to determine is whether or not the candidate is ready to get on the air in the proper manner. That is what licensing is all about.

I have given many code tests. Usually, I send code at a speed measured by looking at the second hand on my wristwatch. It may not be a highly accurate method but it should be close enough. I usually manage to squeeze five words of five-letter length in one minute. Over a period of five minutes, any inequities should balance out. In most cases, five words per minute is easily judged by most General-class license holders.

I make up my own QSOs and follow by allowing the candidate all the time he needs to make sense of the text he has copied. Then I present the ten standard questions: "Who were you talking to? What age? What callsign? etc." The method seems to be fair, and if the candidate can honestly copy code he should have no trouble passing.

The last time I administered the Novice code test I deviated from my standard practice. As thousands of hams have done in the past, I gave the test in my ham shack at home. The candidate arrived, carrying his own newly acquired transceiver. He asked if we could set it up and try it out. Yes, that would be fun. Together, we hooked it into my antenna and swr meter, then went through the tuning procedure. I was a bit surprised to see the swr nearly top the scale. Had we forgotten an important step in the tuning procedure? We repeated the steps. Still the swr was alarmingly high. Was it the candidate's new rig? Then the embarrassing moment arrived when I discovered that my antenna switch was turned to the wrong antenna!

The candidate had a fine new hand key that he had mounted on a heavy brass mount. We plugged the key in and I sent out a few V's, then a QRL followed by CQ on low power. Nothing. Then, a few kHz up the band, I answered a rather erratic CQ at about 8 to 9 wpm. I returned the call, and my 10 Watts of power was picked up by a Novice about 150 miles away.

I threw a pencil to the unwary candidate and told him to copy for me. I sent QRS and cut my speed to 5 wpm. The operator at the other end didn't understand my request so I repeated it in plain text: "Pse slow down, I am very nervous." The operator came back at a slightly slower speed, but still very erratic and with many errors. Back again I went, "Please slow down, I have a Novice candidate here in the shack and he is trying to copy you." This was followed by my QTH, name, etc. The other operator came back with his information. I watched as the candidate unknowingly took his code test.

When we signed and sent our 73, I secured the rig.

"How'd you do on the code test?" I asked.

"What test?" the candidate asked.

"The one you just took!" I looked at the piece of paper he had copied the entire QSO on. It was all there, complete with mistakes! The other operator sent his share of L's for F's, G's for W's, and other common beginners' errors. It was his third time on the air! An on-the-air communication had taken place. It wasn't perfect. There were even QRM and QRN to put up with.

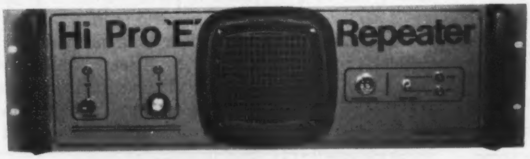
I asked the standard 10 questions. Who? Where? RST? WX? Callsign? It was good copy—not solid copy, but good enough to get the information needed.

The questions I selected at random from the question pool were answered 100% correctly. It was a painless examination for both the candidate and the examiner. We filled out the Form 610 together, carefully and block by block. I didn't want the form to be rejected due to some minor error or oversight. It has not happened to me in the past, but it would be very disappointing for the candidate.

With the 610 safely filled out and signed, I dropped it in the mail the following morning. If all goes well with the U.S. Postal Service and the FCC issuing office, the license should come back within 30 to 40 days. Then we can welcome a new Novice into the fraternity. ■

Hi Pro Repeaters
MELCO
MAGGIORE ELECTRONIC LAB

Manufacturers of Quality Communications Equipment



- **Repeaters**
- **Links**
- **Remote Base**
- **Low Band, VHF,UHF**
- **Receivers**
- **Transmitters**
- **Antennas**

- **Standard and Computerized Controllers**
- **Standard and Computerized Auto Patches**
- **Duplexers**

Hi Pro 'E'

EXPANDABLE REPEATER SYSTEM

- A NEW CONCEPT IN REPEATER DESIGN, THE Hi Pro "E" IS AN EXPANDABLE REPEATER WITH THE FOLLOWING FEATURES: A BASIC REPEATER WHICH WOULD INCLUDE A COMPLETE RECEIVER, TRANSMITTER, COR, FRONT PANEL CONTROLS AND INDICATORS, LOCAL SPEAKER AND MIC JACK AND CAPABLE OF FUTURE EXPANSION. ALL HOUSED IN AN EXTREMELY RUGGED, ENCLOSED, 19-INCH RACK MOUNTABLE CABINET.
- THIS SYSTEM CAN BE EXPANDED AT TIME OF PURCHASE OR CAN BE AN AFTER-PURCHASE ADD ON. THE ADD ONS ARE—HIGHER POWER, 110/220 VAC POWER SUPPLY, IDENTIFIER, AUTO PATCH, OR COMPUTER CONTROLLERS. IN ADDITION TO THESE ADD ONS AN ADDITIONAL RECEIVER AND TRANSMITTER CAN BE MOUNTED INTERNALLY FOR USE AS CONTROL LINKS, REMOTE BASE OR DUAL BAND OPERATION, ETC.
- AN EXTENSION PANEL IS AVAILABLE FOR LOCAL MONITORING OF THE REPEATER AND CONTAINS ALL NECESSARY METERING, STATUS LIGHTS AND INDICATORS. ALL ADD ONS ARE AVAILABLE FROM THE COMPANY AND ARE COMPLETE INCLUDING INSTRUCTIONS. THE Hi Pro "E" IS AVAILABLE IN NOVEMBER.

MAGGIORE ELECTRONIC LAB.
600 Westtown Rd. West Chester, PA 19382 Phone (215) 436-6051 Telex 499 0741 MELCO ✓47

WRITE OR CALL FOR OUR COMPLETE CATALOG

Homer L. Davidson
1517 1st Avenue North
Fort Dodge IA 50501

Troubleshooting With the DMM

A short course on checking diodes and transistors, complete with pictures.

The pocket digital multimeter (DMM) is the ideal test instrument with which to locate a defective transistor or diode in your favorite project, receiver, or consumer electronic equipment. A suspected diode or transistor can be tested within seconds—whether in or out of the circuit—with the diode test. Most DMMs have a diode-transistor test on the function-selector switch marked with a diode symbol. A DMM can be purchased for as little as $39.95.

Besides transistor and diode tests, accurate voltage and resistance measurements can be made. Very low voltage or resistance measurements are required in solid-state equipment. Accurate forward-bias readings of an NPN or PNP transistor are made easily with a DMM, and low collector or emitter voltage measurements can quickly identify a leaky or open transistor.

DMM Operation

Although a few digital multimeters have a regular transistor test, most meters have a diode test which can be used to check the voltage drop at any junction of a transistor. A diode can be checked for open or leaky conditions, while transistor tests can identify open or leaky conditions from any two elements of the transistor. A junction passes the test with a low reading in one direction and a very high reading or an over-range display in the other direction. The diode-test function can check

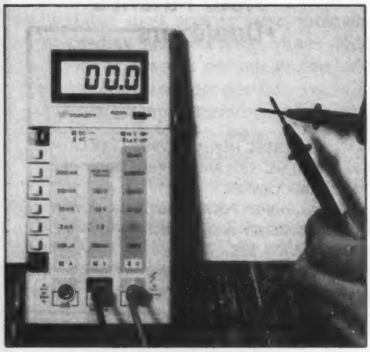


Photo A. Short the test probes together to zero the display before attempting to test the suspected diode or transistor.

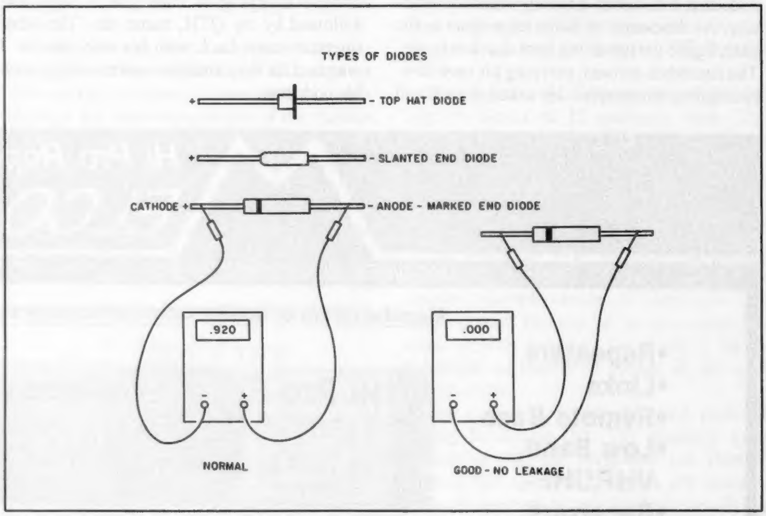


Fig. 1. A normal diode will display a value with the positive lead at the anode and the negative probe at the cathode.

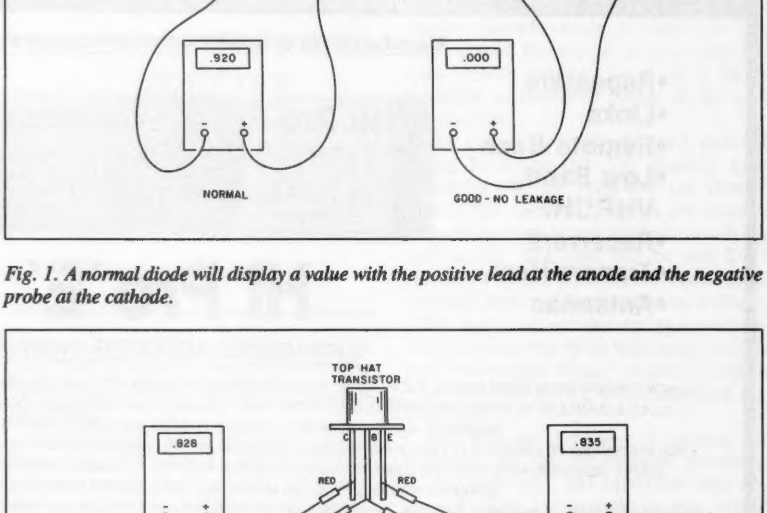


Fig. 2. The PNP transistor is tested in the same manner as is shown in Photo E, except that the negative probe is left on the base terminal.

semiconductor junctions in both diodes and transistors.

Practically every pocket DMM has a liquid-crystal display (LCD) that can be seen under strong lights. These displays are battery operated and have low current consumption. In some models, a weak-battery indicator will appear on the left side of the display. The DMM can operate from 3 to 9 volts for 150–200 hours of continuous use, making the small digital multimeter ideal for even big servicing jobs.

The voltage input range is from 0 to 2,000 volts dc and up to 1,000 volts ac. A fraction of 1 volt can be checked with .5% accuracy.

The resistance range can vary from 0 to 20 megohms with 1% accuracy. The 0–200-Ohm range will quickly check the .47-Ohm resistors found in audio-output transistor circuits. The current range can vary from 200 uA to 10 A with 1.2% accuracy.

How to Test a Diode

The suspected diode can be checked rapidly in or out of the circuit. With an in-circuit test, make sure a transistor, low-value resistor, transformer, or coil winding does not parallel the diode to be tested. If a transistor or resistor is found across the diode's path, a low reading may be found in both directions, indicating that the diode is leaky and is producing an incorrect measurement. When in doubt, remove one end of the diode from the circuit.

Rotate the DMM function switch to the diode-test position. You may find a push-button or rotary-function switch to engage the diode test. Check the zero of the meter by shorting the two test prods together (Photo A).

To test the diode, place the positive (or red) test probe to the anode terminal and the negative (or black) test lead to the cathode (see Fig. 1). The meter should produce a voltage-drop display on the LCD with a normal diode. Now, reverse the test leads. If the over-range display comes on, the diode is good. A normal diode junction will indicate a voltage drop in only one direction.

A leaky diode will indicate a low measurement in *both* directions. This indicates that current flow is occurring in both directions. A leaky diode usually has a resistance from 1k to 2k Ohms.

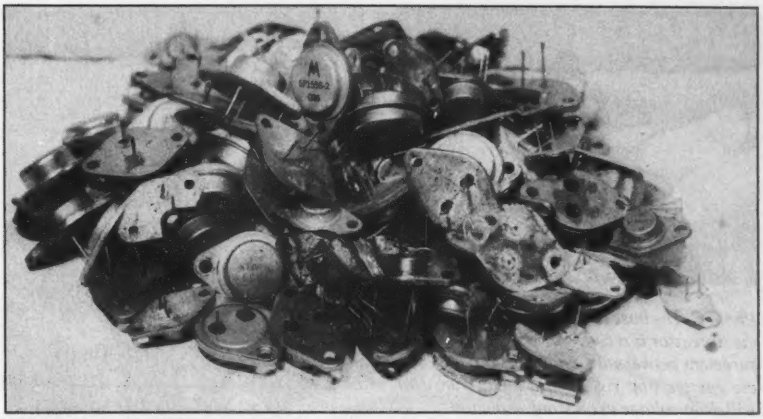


Photo B. Transistors come in many sizes and shapes. Here is a pile of defective transistors taken from a TV, radio, tape player, car radio, and various audio units.

When the measurement is doubtful or a normal reading is not obtained, remove one end of the diode from the circuit. Now take another diode check. If high leakage is suspected, rotate the meter function to the 20k-Ohm range. With a normal diode, you should have a low-resistance measurement in one direction and very high resistance with the test leads reversed.

All fixed diodes, including zeners, can be checked with the above tests. Some damper diodes found in TV horizontal circuits can be checked like any fixed diode, while the old boost diode may not indicate a measurement in any direction. High-voltage stacks made up of layers and layers of seleninum diodes cannot be tested on the normal range of the DMM unless the diode is leaky.

Testing Transistors with the DMM

Transistors come in many sizes and shapes (Photo B). It does not matter what size or shape the transistor is; each can be checked with the diode and transistor test of the DMM. Most transistors in a defective radio can be checked in the circuit within a few minutes. Simply switch the meter to the diode or transistor function and place the probes on two transistor elements.

Place the positive lead of the DMM on the base terminal and the negative lead on the collector terminal of an NPN transistor (Photo D). You should have a resistance reading. Now place the negative probe to the emitter terminal, with the positive lead at the base terminal (Photo E). A similar measurement indicates that the transistor junction is good. If one of the values is really low, a leakage exists between the two elements.

To test a PNP transistor, place the negative probe to the base terminal and the positive lead to the collector terminal and note the value (Fig. 2). Leave the negative probe at the base terminal and move the positive probe to the emitter terminal. The transistor is normal when the two values are about the same.

The defective transistor may be leaky or open and still appear normal. The transistor junction may be open between the base and collector, or the base and emitter terminals (Photo C). The base terminal is common to the other two elements. You may find a leakage reading between any two elements; the emitter-to-collector terminal is the most common culprit. A normal reading between the base and the other two elements will show a voltage drop in only one direction.

Most transistors can be checked very rapidly in the circuit with the DMM, but a low-resistance path between any two elements, such as a coil, transformer, diode, or low-value resistor, may cause an erroneous reading. Again, when in doubt, lift the emitter terminal from the circuit and make another test.

The Open Transistor

The open transistor will have infinite resistance between the open elements. It's possi-

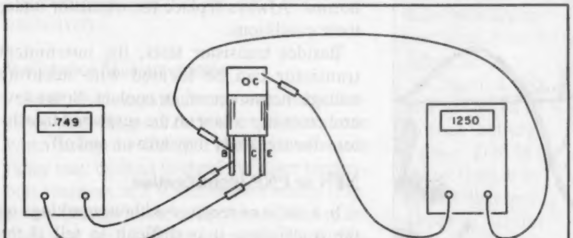


Fig. 3. Although a value might be seen on the display, indicating a junction reading, if the two measurements are not quite close, suspect a high- or low-resistance junction. Replace the transistor.

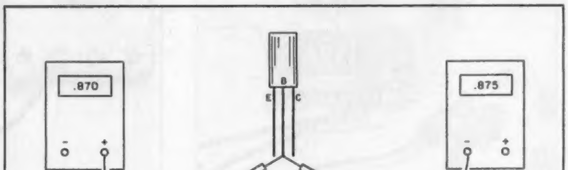


Fig. 4. An NPN or PNP transistor can be identified by observing the polarity of the test leads that result in a display on the DMM.

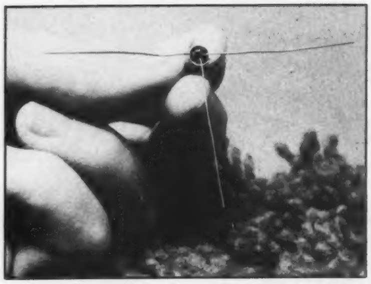


Photo C. The base terminal (bottom center) of the transistor is a common test point for measurement between the collector (top left) and the emitter (top right). A normal transistor will drop voltage in only one direction.

ble to see a normal junction reading between the base and collector terminals and an open indication between the base and emitter terminals. Likewise, an infinite resistance between the base and the collector indicates that the transistor is open.

A transistor never becomes weak like a tube. A poor or high-resistance junction may indicate a defective transistor between the base and either the collector or emitter terminal. For instance, the measurement between the base and emitter terminals may appear normal in an NPN transistor (Fig. 3). When the negative probe is attached to the collector terminal, the reading may be quite high, indicating a high-resistance internal junction. Remember that both measurements should be quite close in a normal transistor.

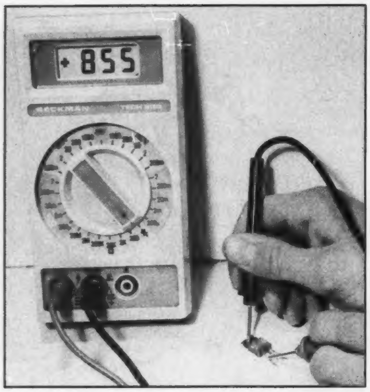


Photo D. Place the positive probe on the base terminal and the negative lead on the collector terminal of an NPN transistor. If the transistor is normal, a measurement can be read.

.859
BECKMAN
TECH 300

Photo E. Now place the negative probe to the emitter terminal with the positive lead at the base terminal. If the transistor is good, the value should be close to that observed at the collector.

The Leaky Transistor

The transistor may appear leaky between any two elements. A leaky transistor will have a low-resistance measurement, from a dead short up to several hundred Ohms (Photo F). To test the transistors for leakage, take a measurement between any two elements. If you reverse the test probes on the same elements and get the the same low measurement, you have a leaky transistor. Leakage measurements above 500 Ohms should be measured on the 20k-Ohm scale. Often the trouble exists between the collector and emitter terminals. Always replace the leaky transistor!

The Intermittent Transistor

A poor junction or internal terminal lead of a transistor may produce an intermittent circuit. Intermittent problems within any electronic device or project are very difficult to locate. Sometimes the intermittent transistor will act up only under load. When tested in or out of the circuit, the transistor may appear normal. Sometimes the transistor will test as intermittent in the circuit, and when removed for accurate tests, the transistor returns to normal. Always replace the transistor under these conditions.

Besides transistor tests, the intermittent transistor can be located with accurate voltage measurements or coolant. Spray several coats of coolant on the suspected transistor—the transistor may turn on and off.

NPN or PNP Identification

In a radio or receiver without markings on the transistors, it is difficult to tell if the transistor is an NPN or PNP type. The identity of any transistor can be quickly determined with the DMM. Remember, if a reading is indicated with the positive lead of the meter on the transistor's base, and the negative lead alternating between collector and emitter, the transistor is NPN (Fig. 4).

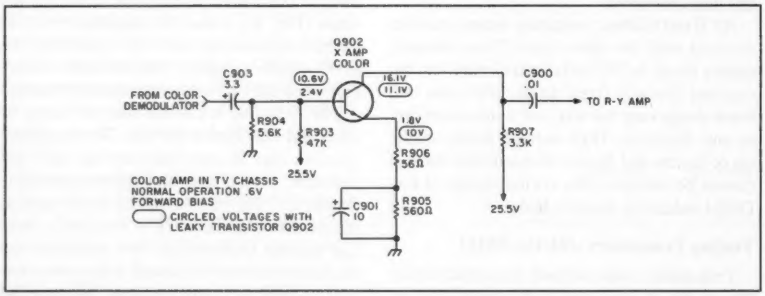


Fig. 5. Critical voltage measurement on the suspected transistor may determine if a transistor is leaky or open. Here, the voltages are quite close on all elements, indicating a leaky transistor.

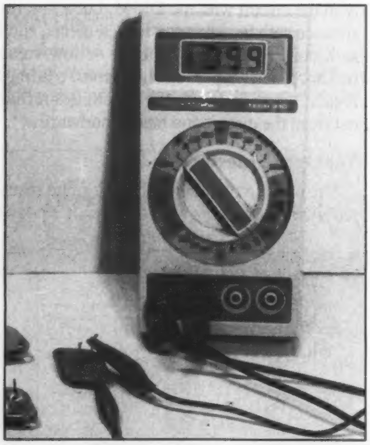


Photo F. A leaky transistor may show a low reading between any two elements in both directions. Here, a 99-Ohm leakage is found between the collector and emitter terminals of an audio-output transistor.

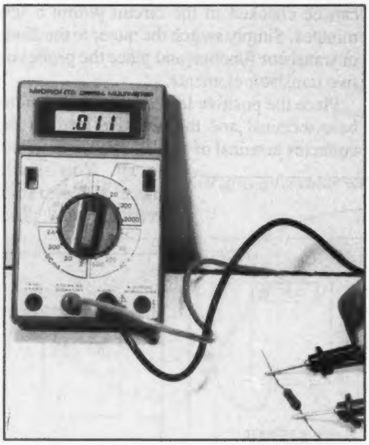


Photo G. Check all resistors for the correct value before replacement. A regular 10-Ohm replacement resistor measures 11 Ohms on the DMM low-value scale—the resistor is within 10%.

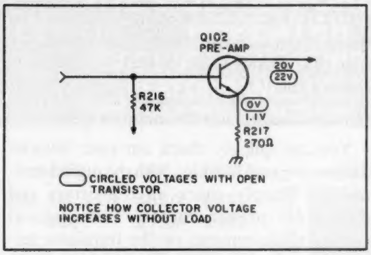

Q102
PRE-AMP
20V
22V
R216
47K
0V
1.1V
R217
270Ω
CIRCLED VOLTAGES WITH OPEN TRANSISTOR
NOTICE HOW COLLECTOR VOLTAGE INCREASES WITHOUT LOAD

Fig. 6. The high collector voltage indicates an open transistor or emitter resistor (R217). Check the emitter resistor with the low-Ohms range of the DMM.

Once the base terminal is located, the collector and emitter terminals can be identified with voltage measurements. Often, the collector terminal will have a higher positive voltage with an NPN transistor, and the emitter terminal will have a very low voltage. In receivers and audio circuits, the emitter terminal has a low-value resistor between the emitter and chassis ground. Sometimes in TV circuits the emitter terminal itself is grounded.

Transistor Voltage Measurements

Accurate voltage measurements may indicate if a transistor is open or leaky. Suspect a leaky transistor when the voltages are similar at all three terminals (Fig. 5). A higher than normal collector voltage may indicate an open transistor. A low voltage at the collector terminal may indicate a leaky transistor or an improper voltage source. Check the voltage at the emitter terminal—no voltage may indicate an open transistor or emitter resistor. Check the emitter-bias resistor using the low-resistance scale of the DMM.

With the transistor in operation, measure the bias voltage between the emitter and base terminals. Be careful not to short the two terminals! An NPN transistor will have a .6-volt measurement, indicating that the transistor is normal, while the forward-bias voltage of a PNP transistor is only .3 volts. In most cases, when an accurate forward-bias voltage is measured between the base and emitter terminals, you can assume that the transistor is normal. Today, most commercial electronic systems use NPN transistors exclusively.

Resistance Measurements

Resistance measurements within the transistor and diode circuits are quite accurate when using the DMM. The low-resistance range may be used to check for open emitter-bias resistors in TV and audio circuits (Fig. 6). No voltage on the collector terminal of the transistor may indicate an open collector resistor or coil winding.

It's best to remove one end of a resistor and then check for correct resistance. Check the replacement resistor for the correct value before installing it (Photo G)—you may have misread the color code or the resistance may not be what is marked.

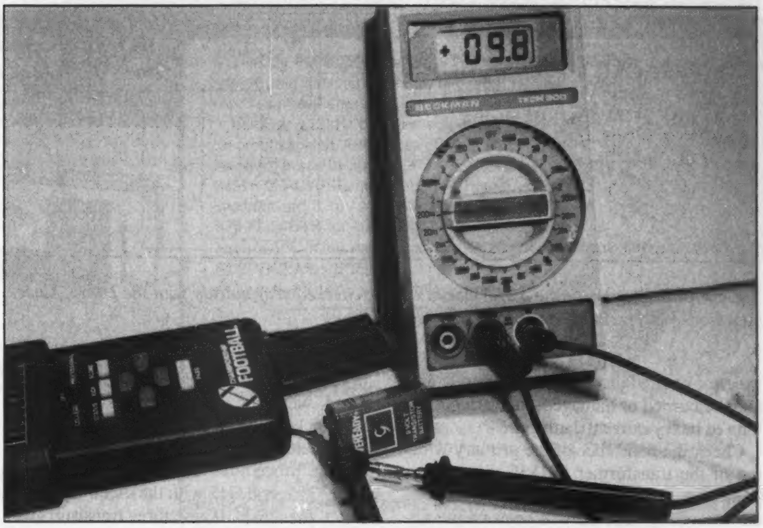


Photo H. Check the current drain if batteries die quickly.

DMM Problems

After many hours of use, your digital multimeter may come up with a few service problems. If measurement is erratic or there are no resistance or voltage measurements, suspect a broken test lead. The probe leads tend to break right at the end of the probe, or where the lead enters the banana jack. Cut off the broken lead and repair the probe terminal. Sometimes it's best to have another set of test leads handy if the meter is used a lot.

Erratic or intermittent measurements may be caused by the banana-type plugs on the meter. Sometimes these plugs get dirty and cause erratic readings of the meter. Rotate the function switch to the low-resistance scale. Hold the test probe together to get a zero reading. Now, flex the cable and move the plugs at the meter. Suspect dirty contacts if the meter reading rapidly changes. Clean up the female contact jack and spread the male banana plug sections for a tighter fit.

A dim LCD may be caused by a weak battery. Some DMMs have a battery indicator that produces a signal when the battery becomes weak. The LCD letters or over-range value will be really dark with a set of new batteries. If the digital multimeter is not used very much, the batteries may become defective from normal shelf life.

How to Check Power-Supply Circuits

Shorted or leaky diodes are a common problem in low-voltage power supplies. The leaky diode can blow the fuse or destroy the primary winding of a transformer in radios or tape players. Sometimes lightning strikes the power line and destroys the silicon diodes. You may find two diodes in a full-wave rectifier circuit or four in a bridge-rectifier circuit (Fig. 7).

Use the diode-test position of the DMM. Lift one lead of each diode in the circuit. A normal diode will show a resistance measurement in only one direction. Replace each

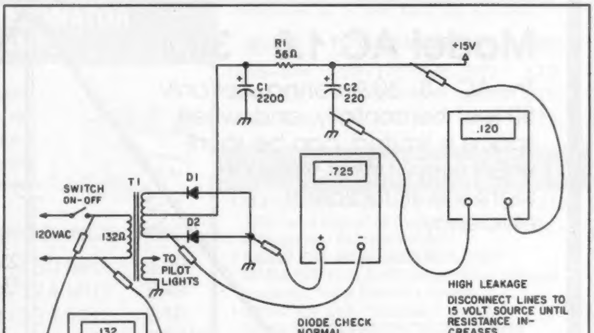


Fig. 7. You may find two diodes in a full-wave rectifier with four diodes in a bridge-rectifier circuit. Remove one end of each diode for leakage tests.

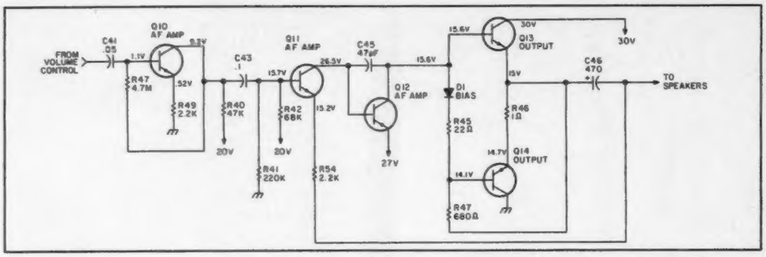


Fig. 8. All transistors in the audio circuit can be checked very quickly with the DMM. Check bias diodes and resistors if the sound is distorted.

leaky or shorted diode. The diode body area may be burned or damaged, indicating lightning or heavy-current damage.

Check the resistance of the primary winding of the transformer (T1) if one or more diodes are leaky. Sometimes a dead short on the secondary winding will open up the primary winding of the transformer. If the diodes appear warm after installation, check the power-supply load or connecting circuits for possible leakage. C1 may be leaky. Check the resistance across C1 for a low measurement. Remove all the load wires connected to the positive terminal of C1 if a very low resistance is found. Then check each connecting load wire for the shorted component.

How to Check Audio Circuits

Some type of an audio circuit is found in practically all consumer electronic products. Dead, weak, or distorted audio circuits can be checked within minutes with the digital multimeter (Fig 8). Here is an audio-circuit service procedure: Quickly check af amps Q10, Q11, and Q12 with the diode-transistor test of the DMM. These three transistors can be checked in the circuit without any problems. A leaky or open af transistor may cause a weak or dead audio circuit.

Quickly check Q13 and Q14 in the circuit for open conditions. If leakage is noted between two elements, remove the transistor and test it out of the circuit. A leaky or open output transistor may produce a weak and distorted sound. Check each bias resistor (R46, R45, and R47) with Q14 out of the circuit. Often, a leaky or shorted transistor may destroy the bias resistor. Remove one end of D1 and check for leakage. A leaky bias diode may cause distortion in the sound. By now you should have located the defective component.

How to Check Your Favorite Project

You can quickly check out your favorite project or game machine with the digital multimeter. Simply check all transistors and diodes for proper values. Take critical voltage measurements on the transistor terminals and also determine if the correct voltage source is being fed to the integrated circuits.

Various resistors and momentary pushbutton switches can be checked for continuity with the low-value scale. Often, a dirty or poor switch contact may prevent a project from working. Lift one lead of the resistor.

When the project will not operate, suspect a leaky component that is causing the unit to draw excessive current. If the project is operated from batteries, measure the voltage across the battery terminals with the unit operating. A low battery reading may indicate a defective component. Place the test probes of the DMM in series with the battery leads and take a current measurement (Photo H).

Remember, your project may not work because of a *new* defective part! Just because the component is new doesn't mean it's okay. Check it out with the DMM. If your favorite project is collecting dust, dig it out, dust it off, and give the DMM a try at locating the defective component or bad connection. ■

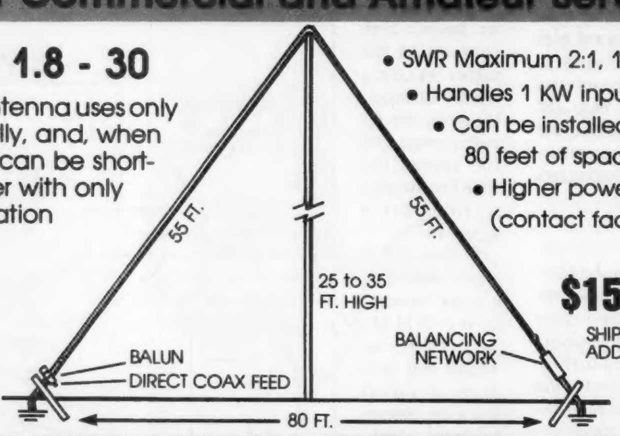
NEW from BARKER & WILLIAMSON!

1.8 - 30 MHz. Continuous Coverage Antenna for Commercial and Amateur Service

Model AC 1.8 - 30

The AC 1.8 - 30 Antenna uses only 80 feet horizontally, and, when space is limited, can be shortened even further with only slight loss of radiation efficiency.

- SWR Maximum 2:1, 1.4:1 Average
- Handles 1 KW input ICAS
- Can be installed in approximately 80 feet of space
- Higher power models available (contact factory)



$159.50
SHIPPING AND HANDLING ADD $4.00

B&W
BARKER & WILLIAMSON
ALL OUR PRODUCTS MADE IN USA
Quality Communication Products Since 1932
At your Distributors write or call, 10 Canal Street, Bristol PA 19007
(215) 788-5581

THE MOST AFFORDABLE REPEATER

ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

BAND	KIT	WIRED
6M, 2M, 220	$630	$880
440	$730	$980

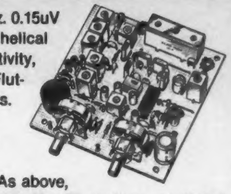
(Also available for commercial bands)

hamtronics
REP200 REPEATER

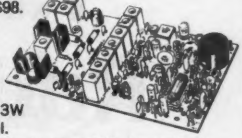
FEATURES:

- SENSITIVITY SECOND TO NONE; 0.15 uV (VHF), 0.2 uV (UHF) TYP.
- SELECTIVITY THAT CAN'T BE BEAT! BOTH 8 POLE XTAL FILTER & CERAMIC FILTER FOR > 100 dB AT ± 12KHZ. HELICAL RESONATOR FRONT ENDS TO FIGHT DESENSE & INTERMOD.
- OTHER GREAT RECEIVER FEATURES: FLUTTER-PROOF SQUELCH, AFC TO COMPENSATE FOR OFF-FREQ TRANSMITTERS, SEPARATE LOCAL SPEAKER AMPLIFIER & CONTROL.
- CLEAN, EASY TUNE TRANSMITTER; UP TO 20 WATTS OUT (UP TO 50W WITH OPTIONAL PA).

HIGH QUALITY XMTR & RCVR MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.



- **R144/R220 FM RCVRS** for 2M or 220 MHz. 0.15uV sens.; 8 pole xtal filter & ceramic filter in i-f, helical resonator front end for exceptional selectivity, > 100 dB at ± 12kHz, best available today. Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit only $138.
- **R451 FM RCVR** Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $138.
- **R76 FM RCVR** for 10M, 6M, 2M, or 220. As above, but w/o AFC or hel. res. Kits only $118. Also avail w/4 pole filter, only $98/kit.
- **R110 VHF AM RECEIVER** kit for VHF aircraft or ham bands or Space Shuttle. Only $98.



- **TA51 VHF FM EXCITER** for 10M, 6M, 2M, or 220 MHz. 2 Watts continuous, up to 3W intermittent. Kit only $68
- **TA451 UHF FM EXCITER** 2W cont., up to 3W intermittent. Kits only $68. Xtal oven avail.
- **VHF & UHF LINEAR AMPLIFIERS.** For either FM or or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Several models. Kits from $ 78.

NOW—FCC TYPE ACCEPTED TRANSMITTERS, RECEIVERS, AND REPEATERS AVAILABLE FOR HIGH-BAND AND UHF. CALL FOR DETAILS.

RECEIVING CONVERTERS

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

RECEIVING CONVERTER
RCVR
ANT

VHF MODELS

Kit with Case	$49
Less Case	$39
Wired	$69

Antenna Input Range	Receiver Output
28-32	144-148
50-52	28-30
50-54	144-148
144-146	28-30
145-147	28-30
144-144.4	27-27.4
146-148	28-30
220-222	28-30
220-224	144-148
222-226	144-148
220-224	50-54
222-224	28-30

UHF MODELS

Kit with Case	$59
Less Case	$49
Wired	$75

Antenna Input Range	Receiver Output
432-434	28-30
435-437	28-30
432-436	144-148
432-436	50-54
439.25	61.25
902-928	422-448

SCANNER CONVERTERS Copy 806 MHz band on any scanner. Wired/tested ONLY $88.

TRANSMIT CONVERTERS

For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

For VHF,
Model XV2
Kit $79
Wired $149
(Specify band)

Exciter Input Range	Antenna Output
28-30	144-146
28-29	145-146
28-30	50-52
27-27.4	144-144.4
28-30	220-222*
50-54	220-224
144-146	50-52
144-146	28-30

For UHF,
Model XV4
Kit $79
Wired $139

Exciter Input Range	Antenna Output
28-30	432-434
28-30	435-437
61.25	439.25
144-148	432-436*

*Add $20 for 2M input

VHF & UHF LINEAR AMPLIFIERS. Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

LOW-NOISE PREAMPS

INPUT
OUTPUT
HAMTRONICS

Hamtronics Breaks the Price Barrier!

*

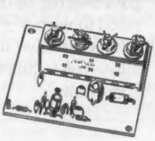
No Need to Pay $80 to $125 for a GaAs FET Preamp.

FEATURES:
- Very Low Nose: 0.7dB VHF, 0.8dB UHF
- High Gain: 13 to 20dB, Depending on Freq.
- Wide Dynamic Range for Overload Resistance
- Latest Dual-gate GaAsFET, Very Stable

MODEL	TUNES RANGE	PRICE
LNG-28	26-30 MHz	$49
LNG-50	46-56 MHz	$49
LNG-144	137-150 MHz	$49
LNG-160	150-172 MHz	$49
LNG-220	210-230 MHz	$49
LNG-432	400-470 MHz	$49
LNG-800	800-960 MHz	$49

HELICAL RESONATOR PREAMPS

Low-noise preamps with helical resonators reduce intermod and cross-band interference in critical applications. 12 dB gain.



MODEL	TUNING RANGE	PRICE
HRA-144	143-150 MHz	$49
HRA-(*)	150-174 MHz	$49
HRA-220	213-233 MHz	$49
HRA-432	420-450 MHz	$64
HRA-(*)	450-470 MHz	$64

**Specify Center frequency desired*

MINIATURE PREAMPS

GaAsFET Preamps with features similar to LNG, except designed for LOW COST and SMALL SIZE: only 5/8"W × 1-5/8L × 3/4H. Easily mounts inside many radios.

NEW

Model LNW-(*) ..... Only $19/kit, $34wired

Models available to tune the following bands: 25–35, 35–55, 55–90, 90–120, 120–150, 150–200, 200–270, and 400–500 MHz.

*Specify band

IN-LINE PREAMPS

NEW

ANT
RCVR
PREAMP IN CKT
POWER
hamtronics
LNS TRANSCEIVER PREAMP

GaAsFET Preamp with features like LNG. Automatically switches out of line during transmit. Use with base or mobile transceivers up to 25W. Tower mtg hdwr incl.

MODEL	TUNES RANGE	KIT	WIRED
LNS–144	120–175 MHz	$59	$79
LNS–220	200–240 MHz	$59	$79
LNS–432	400–500 MHz	$59	$79

ACCESSORIES

- **MO-202 FSK DATA MODULATOR.** Run up to 1200 baud digital or packet radio signals through any FM transmitter.
- **DE-202 FSK DATA DEMODULATOR**
- **COR-2 KIT** With audio mixer, local speaker amplifier, tail & time-out timers.
- **COR-3 KIT** with "courtesy" beep".
- **DTMF DECODER/CONTROLLER KITS**
- **AUTOPATCH KITS.** Provide repeater autopatch, reverse patch, phone line remote control of repeater, secondary control.
- **CWID KITS** • **SIMPLEX AUTOPATCH**

- Send $1 for Complete Catalog
  (Send $2.00 or 4 IRC's for overseas mailing)
- Order by phone or mail • Add $3 S & H per order
  (Electronic answering service evenings & weekends)
- Use VISA, MASTERCARD, Check, or UPS COD.

hamtronics, inc.
65-D MOUL ROAD • HILTON NY 14468
Phone: 716-392-9430

Hamtronics® is a registered trademark

Greg Swain

Kit Corner: The DSE Radio Direction Finder

Excerpted with permission from the February, 1986, issue of Electronics Australia.

Most readers will be broadly familiar with the concept of a radio direction finder (RDF). A basic RDF consists of a receiver and an antenna which can be rotated on its own axis. The direction of the transmitter is found by rotating the antenna for a signal peak or null.

You can easily demonstrate the effect for yourself using a portable transistor radio fitted with a ferrite rod antenna. By tuning the radio to a station and rotating the radio about its vertical axis, a null will be found in the signal strength. The ferrite rod antenna will then point in the direction of the station.

Of course, this method requires that "fixes" be taken at two or more widely spaced locations in order to find the true location of the transmitter. The exact location of the transmitter is determined by simple triangulation.

The classic application of this radio direction finding technique was in World War II. Many war movies showed how it was possible to track down enemy transmitters using special vans fitted with RDF equipment. Typically, these vans were fitted with a large external loop antenna which could be manually rotated. An operator inside the van listened in on headphones for peaks and dips in the signal strength. Provided the transmitter remained in the one location for long enough, its location could eventually be pinpointed.

The Dick Smith Radio Direction Finder is just the ticket for tracking down illegal transmitters and antisocial radio operators. Depending on the antenna system, it can operate on any band from 50 to 500 MHz and will work with FM receivers ranging from pocket scanners to amateur radio and CB transceivers.

Physically, the radio direction finder consists of two separate units. One contains the control and display electronics, and the other is a special antenna-switching unit (ASU) which is connected to the control unit via a 4-conductor cable.

An electronic "compass" display consisting of 32 LEDs indicates the transmitter bearing. When a signal is received, its relative bearing to the antenna system is indicated by whichever of the 32 LEDs illuminates.

In fixed installations, this allows the compass bearing of the signal to be directly indicated to within ±5.6 degrees. When an RDF unit is installed in a car, successive readings allow you to pinpoint the exact location of the transmitter.

How It Works

The theory of operation is reasonably simple. Radio signals received on a rapidly moving antenna undergo a frequency shift due to the Doppler effect, an effect well known to anyone who has observed a moving car with its horn blowing.

Consider a single antenna mounted on the edge of a rapidly spinning disc (Fig. 1). As the antenna moves towards the source of the rf carrier, the apparent frequency will increase due to the Doppler effect (Fig. 2). Conversely, as the antenna moves away, the frequency will decrease.

Thus, the rotating antenna causes frequency modulation of the received carrier. When this type of antenna is connected to an FM receiver, a tone is heard. By analyzing the phase of this tone, the direction of the transmitter can be determined.

To avoid the obvious drawback of a mechanically rotated system, the Dick Smith RDF simulates a rotating antenna electronically. Four vertical whip antennas are arranged around a circle with a diameter of 0.07–0.4 wavelengths. The antennas are electronically switched clockwise in sequence such that all four antennas are scanned once every 1/1250th of a second.

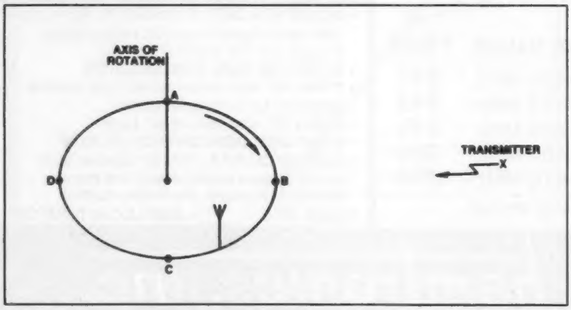


Fig. 1. Signals received by an antenna mounted on the edge of a rotating disc are frequency modulated due to the Doppler effect.

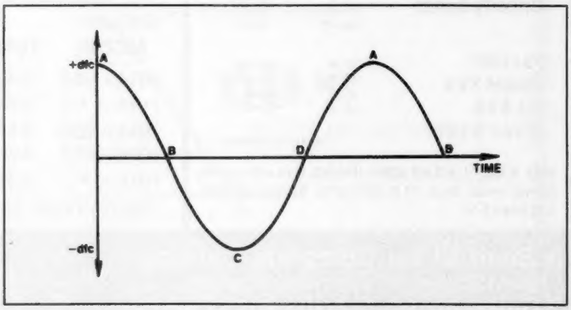
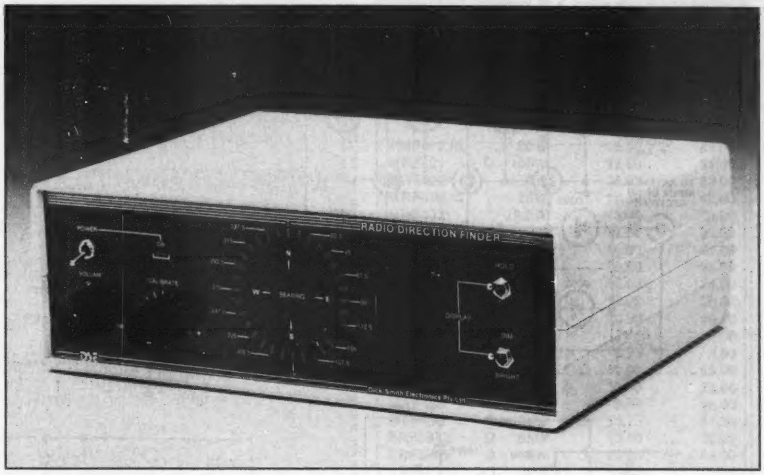


Fig. 2. This graph illustrates the frequency shift as the antenna moves towards and away from the transmitter.



The Dick Smith Electronics Radio Direction Finder.

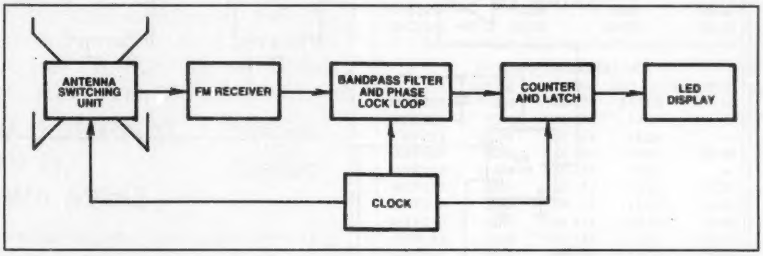


Fig. 3. Block diagram of the Radio Direction Finder. Signals from the antenna-switching unit are fed to an FM receiver and the output is compared to a reference phase.

This situation is equivalent to one vertical antenna mounted on the perimeter of a disc spinning at 1250 revolutions per second. A diameter of, say, 800 mm (for the 2-meter band) results in a tangential velocity of 3140 meters per second.

If the carrier frequency is 144 MHz, the carrier will deviate 1.5 kHz at a rate of 1250 Hz. For lower carrier frequencies, the deviation will be proportionally lower. Note, however, that the 1250-Hz modulating tone remains constant, as it is a function of the antenna switching rate only.

The output from the FM receiver is applied to the signal input of the RDF adapter and compared with an internal reference phase. The resultant phase angle appears as a 5-bit binary code which is decoded to a one-of-32 output to drive the appropriate LED indicator.

In addition, the detected audio tone can be monitored on an internal loudspeaker. This provides an audible indication that the receiver is correctly tuned to the transmitter frequency.

The Circuit

Antenna switching is accomplished by first deriving a 2-bit binary code from a 1-MHz master oscillator. Here's how it's done:

Inverter stages IC2a, b, and c (4069) form the 1-MHz oscillator, with buffering provided by IC2d. This clocks decade counters IC4 and IC7, both of which divide by five to produce a 40-kHz signal on pin 1 (CK) of IC10.

IC10 is a 4024 7-stage binary counter. Its Q1–Q5 outputs directly drive the D1–D5 inputs of IC12, a 40174 hex latch, while Q4 and Q5 also drive IC9, which is a 4555 one-of-four decoder.

What happens is that IC9 accepts a 2-bit binary code from IC10 and provides the quadrature antenna-switching signals. These signals are interfaced by a 1488 line driver (IC6). The outputs of IC6 swing positive and negative in sequence to provide bias for the matrix diodes (D201–D208) in the antenna-switching unit (ASU).

The diode matrix is arranged so that, at any given instant, three of the antennas are effectively shorted and only one is coupled to the receiver. For example, when pin 11 of IC6 is low (−9 V), D205–D207 are forward-biased and short out antennas 2 to 4. At the same time, D201 will also be forward-biased while D202–D204 are turned off. Antenna 1 will thus be connected to the receiver.

The detected audio tone from the FM receiver is applied to the input of the RDF adapter, limited by D1 and D2, and filtered by a single-pole active low-pass filter stage (IC5). This chip is described by National Semiconductor as an MF5 Universal Monolithic Switched Capacitor Filter. Basically, it is a general-purpose active-filter building block.

The rest of IC5 is configured as a second-order bandpass filter to remove unwanted audio modulation from the 1250-Hz tone. The center frequency of the filter is set to 1250 Hz by the clock signal applied to pin 8. This clock signal is derived via IC3, which divides the 1-MHz master oscillator signal by eight.

Note that the clock for the bandpass filter is derived from the same source as that used to switch the antennas. This means that the filter is automatically centered on the scanning tone, even when there is some frequency drift.

The output of IC5 (pin 1) is a sine wave with a nominal frequency of 1250 Hz. This signal is applied to op amp IC11a, which functions as a phase shifter. Adjustment of the phase shifter is by means of VR1.

The job of the phase shifter is to allow calibration of the circuit and to compensate for any audio phase shifts in the receiver.

From there, the signal is further processed by a 4046 phase-locked loop (PLL). The function of this stage is to average out any modulation present in the passband of IC5 and to produce a 1250-Hz square wave which is essentially free of noise and jitter.

It is this signal that is used to latch IC12. The output of the PLL (pins 3 and 4) is first inverted by IC2f and applied to D-type flip-flop IC13a. Subsequently, when the flip-flop's D input goes high, IC13a latches IC12 on the first positive-going clock pulse from pin 10 of IC4.

The result of all this is that IC12 is latched with a 5-bit code that is directly related to the transmitter direction. A phase-comparator function is thus performed.

Note that IC13a is necessary to prevent the latching signal from coinciding with a change of data on IC12's inputs.

A pair of 74LS154 one-of-16 decoders (IC101 and IC102) on the display board converts the 5-bit code to a one-of-32 output. These decoders directly drive the 32 display LEDs to indicate that transmitter position.

Switch SW102 allows the display to be held or "frozen" by resetting IC13a. SW101 serves as a power on/off switch, while SW103 allows the display to be dimmed by switching a 330-Ohm resistor into the common anode circuit of the LED display.

To make the unit as easy as possible to use, the audio output from the FM receiver is also fed to an internal loudspeaker. The volume is adjusted by means of potentiometer VR102, which is mounted on the front panel.

Power Supply

Power for the RDF unit is derived from an external 12-V source which connects to a 2-conductor socket on the rear panel. This supplies +12 V direct to several ICs and to the input of 3-terminal regulator IC1. IC1, in turn, supplies a regulated +5-V rail to the remaining ICs.

Op amp IC11b provides a buffered +6-V rail to IC5 and also to the phase-calibration control (VR101).

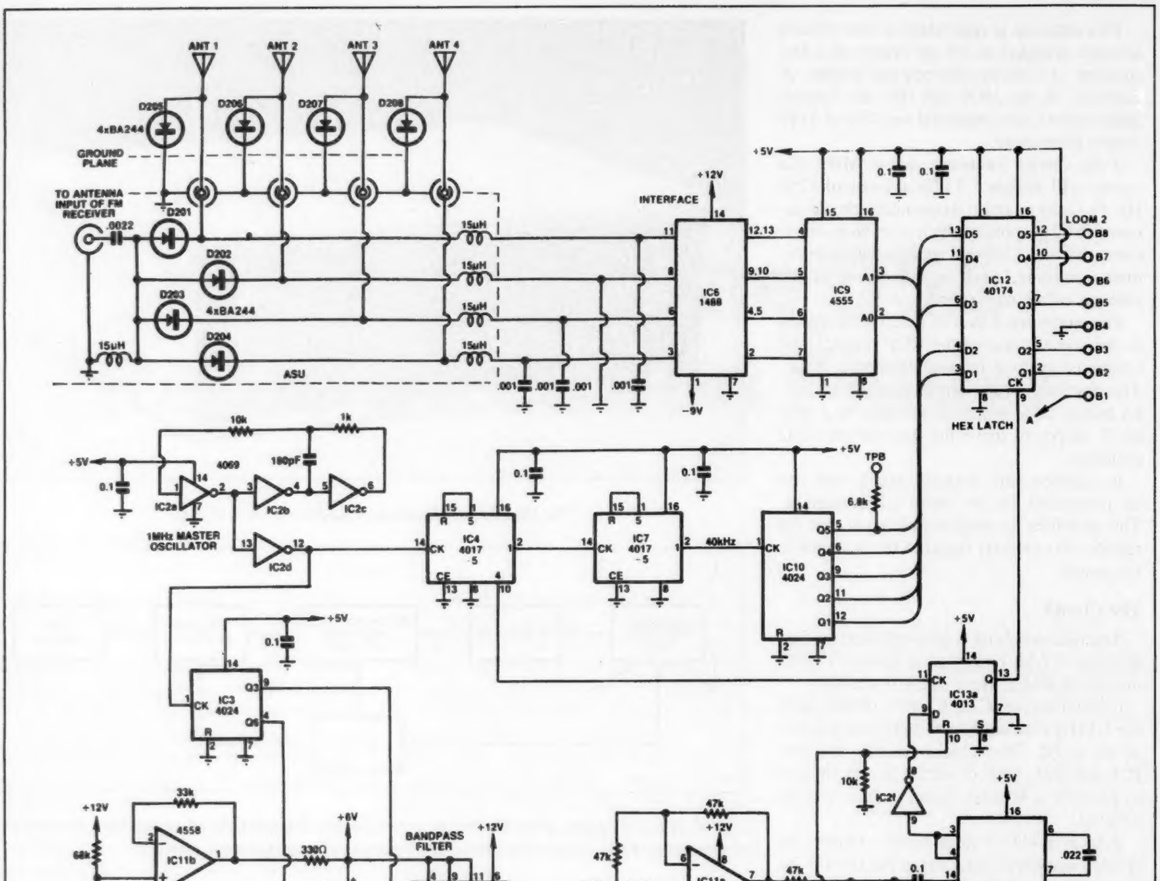

ANT 1
ANT 2
ANT 3
ANT 4
D205
D206
D207
D208
4xBA244
GROUND PLANE
TO ANTENNA INPUT OF FM RECEIVER
D201
D202
D203
D204
.0022
15uH
ASU
INTERFACE
+12V
-9V
IC6 1488
IC9 4555
IC12 40174
HEX LATCH
LOOM 2
B8
B7
B6
B5
B4
B3
B2
B1
+5V
0.1
.001
10k
1k
180pF
4069
IC2a
IC2b
IC2c
IC2d
1MHz MASTER OSCILLATOR
IC4 4017 -5
IC7 4017 -5
40kHz
IC10 4024
TPB
6.8k
IC3 4024
IC13a 4013
IC2f
IC14 4046
AVERAGING AND INTERFACING
.022
15k
27k
VR1 50k
120k
2.2 TANT
33k
47k
IC11b 4558
68k
330Ω
+6V
1 50VW
BANDPASS FILTER
IC5 MF5
150k
0.33
.0027
IC11a
PHASE SHIFTER
4.7k
TO AUDIO OUTPUT OF RECEIVER
TPA
2x1N914
D1
D2
IC8 555
10 16VW
2xBAX18
D5
D4
47 16VW
Q1 BC548
.01
+12V INPUT
F1 250mA
LOOM 1
A1
A2
A3
A4
A5
A6
A7
A8
IC1 7805
IN
OUT
GND
D3 1N4002
470 16VW
VIEWED FROM BELOW
B
E
C

Fig. 4. The control and antenna-switching circuitry.

Finally, a −9-V supply rail is required for the 1488 line-driver IC. This is generated by a dc-to-dc converter circuit based on 555 timer IC8. It buffers a 16-kHz square wave derived from IC3 and drives a diode charge pump based on D4 and D5 to produce the required −9-V rail.

Transistor Q1 simply functions as a switch. Its job is to interface the +5-V CMOS circuit to the +12-V timer circuit.

Construction

Construction is straightforward, with most of the parts mounted on three PC boards, two in the main unit and one in the ASU.

A plastic instrument case fitted with a per-

SPECIALIZED COMMUNICATIONS FOR TODAY'S RADIO AMATEUR!

SPEC-COM
"A5" TRADITION EXPANDS FORMAT!

If you are ACTIVE in FSTV SSTV, FAX, OSCAR, PACKET, RTTY, EME, LASERS, TURO, or COMPUTERS, you need

"THE SPEC-COM JOURNAL™"
Now in our 18th year of service!

Published 10 Times
Per Year
By WB0QCD

CALL TOLL-FREE 1-800-628-2828 ext. 541

...and place your subscription order today! Our Membership Services HOTLINE is good for all 50 U.S. States including Hawaii & Alaska and ALL of CANADA! U.S. subscriptions $20 per year. Foreign slightly higher. A Master Article Index Special Issue is available for $3.00 postpaid.

MasterCard

THE SPEC-COM JOURNAL
P.O. BOX H,
LOWDEN, IOWA 52255

VISA®

Credit Card Orders (5% added) ✓35 Iowa Residents Add 4% State Sales Tax

Measure Up With Coaxial Dynamics Model
83000A RF Peak Reading Wattmeter

Take a PEAK with Coaxial Dynamics "NEW" Model 83000A, designed to measure both FWD/RFL power in CW and FM systems simply and quickly. Then with a "FLIP" of a switch, measure "PEAK POWER" in most AM, SSB or pulse systems. Our Model 83000A features a complete selection of plug-in-elements plus a 2 year warranty. This makes the Model 83000A an investment worth looking at. So go ahead, take a "PEAK", you'll like "WATT" you see!

Contact us for your nearest authorized Coaxial Dynamics representative or distributor in our world-wide sales network.

R.F. WATTMETER

COAXIAL DYNAMICS, INC.

15210 Industrial Parkway
Cleveland, Ohio 44135
216-267-2233
1-800-COAXIAL
Telex 98-0630

Service and Dependability... a Part of Every Product

✓45

RF TRANSISTORS

2-30 MHz 12V (= 28V)*

P/N		Rating	Each	Match Pr.
MRF412,/A		80W	18.00	45.00
MRF421	Q	100W	22.50	51.00
MRF422*		150W	38.00	82.00
MRF426,/A*		25W	18.00	42.00
MRF433		12.5W	12.00	30.00
MRF449,/A	Q	30W	12.50	30.00
MRF450,/A	Q	50W	14.00	31.00
MRF453,/A	Q	60W	15.00	35.00
MRF454,/A	Q	80W	15.00	34.00
MRF455,/A	Q	60W	12.00	28.00
MRF458		80W	20.00	46.00
MRF475		12W	3.00	9.00
MRF476		3W	2.75	8.00
MRF477		40W	11.00	25.00
MRF479		15W	10.00	23.00
MRF485*		15W	6.00	15.00
MRF492	Q	90W	16.75	37.50
SRF2072	Q	65W	13.00	30.00
SRF3662	Q	110W	25.00	54.00
SRF3775	Q	75W	14.00	32.00
SRF3795	Q	90W	16.50	37.00
CD2545		50W	23.00	52.00
SD1487	Q	100W	36.00	76.00
2SC2290		60W	15.00	36.00
2SC2879	Q	100W	25.00	56.00

Q = Selected High Gain Matched Quads Available

VHF/UHF TRANSISTORS

	Rating	MHz	Net Ea.	Match Pr.
MRF212	10W	136-174	$16.00	—
MRF221	15W	136-174	10.00	—
MRF222	25W	136-174	14.00	—
MRF224	40W	136-174	13.50	32.00
MRF237	4W	136-174	3.00	—
MRF238	30W	136-174	13.00	30.00
MRF239	30W	136-174	15.00	35.00
MRF240	40W	136-174	18.00	41.00
MRF245	80W	136-174	28.00	65.00
MRF247	75W	136-174	27.00	63.00
MRF260	5W	136-174	7.00	—
MRF261	10W	136-174	9.00	—
MRF262	15W	136-174	9.00	—
MRF264	30W	136-174	13.00	—
MRF607	1.75W	136-174	3.00	—
MRF641	15W	407-512	22.00	49.00
MRF644	25W	407-512	24.00	54.00
MRF646	40W	407-512	26.50	59.00
MRF648	60W	407-512	33.00	69.00
SD1441	150W	136-174	74.50	170.00
SD1477	100W	136-174	32.50	78.00
2N3866*	1W	30-200	1.25	—
2N4427	1W	136-174	1.25	—
2N5591	25W	136-174	13.50	34.00
2N6080	4W	136-174	7.75	—
2N6081	15W	136-174	9.00	—
2N6082	25W	136-174	10.50	—
2N6083	30W	136-174	11.50	24.00
2N6084	40W	136-174	13.00	31.00

MISC. TRANSISTORS & MODULES

MRF134	$16.00	SAV6	$32.50
MRF136	21.00	SAV7	30.00
MRF137	24.00	S10-12	13.50
MRF138	35.00	2SC1075	25.00
MRF140	89.50	2SC1307	5.00
MRF150	89.50	2SC1946A	12.00
MRF172	62.00	2SC1969	3.00
MRF174	80.00	2SC2221	10.00
2N1522	7.95	2SC2269	20.00
2N4048	7.20	2SC2289	22.00
NE41137	3.50	2SC2312C	4.00
2N5590	11.00	2N5945	10.00
2N5642	14.00	2N5946	13.00

Selected, matched finals for Icom, Atlas, Yaesu, Kenwood, Cubic, TWC, etc. Technical assistance and cross-reference on CD, PT, SD, SRF and 2SC P/Ns.

Quantity parts users — call for quote

WE SHIP SAME DAY • C.O.D./VISA/MC

Minimum Order— Twenty Dollars

(619) 744-0728

RF PARTS

1320-16 Grand Avenue
San Marcos, CA 92069 ✓69

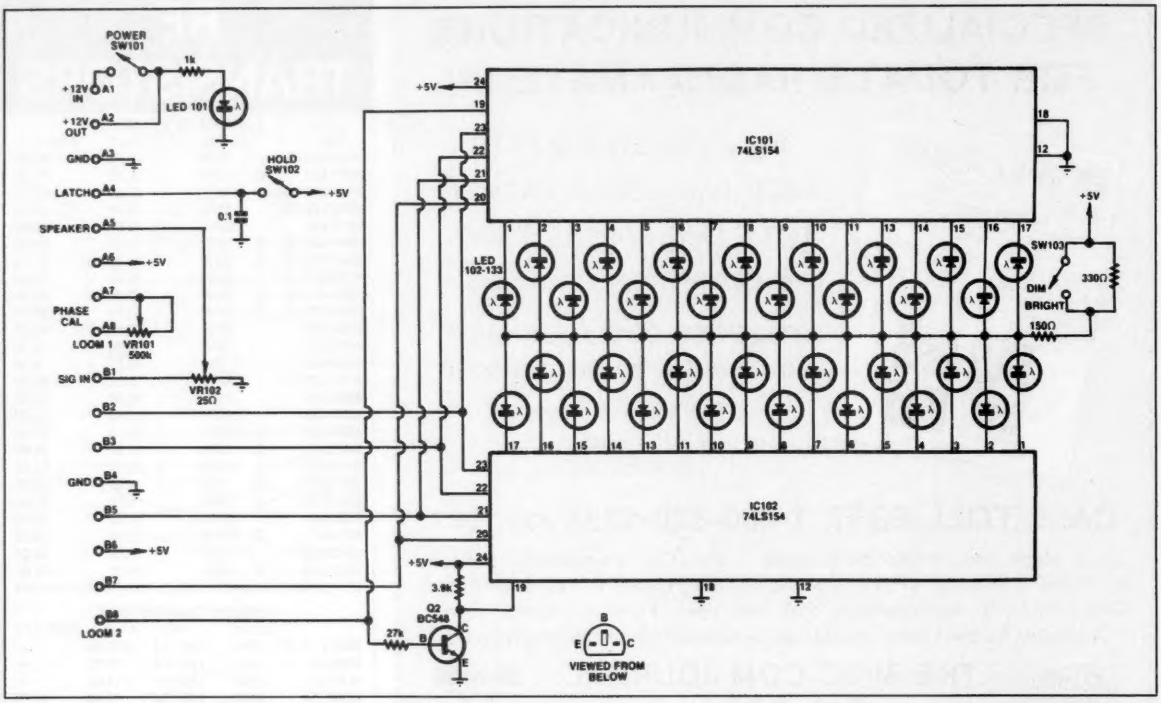


Fig. 5. The display circuit.

spex front panel houses the control electronics, while the ASU board is housed in a plastic project box.

Connections between the ASU and the control unit should be run using 4-conductor cable, while the connection to the FM receiver should be run using coaxial cable. All you have to do is trim the cables to the desired lengths and terminate them with the appropriate plugs.

Note that the wiring connections to the plugs at both ends of the control cable must be made on a one-to-one basis, otherwise the antennas will not rotate in the correct sequence.

Setting Up

An alligator clip lead and a small screwdriver are all that is necessary to adjust the unit.

Connect up a 12-V supply (be careful of polarity!) and switch on with the hold off and the ASU disconnected. All the LEDs in the display should rapidly flicker on and off as the display is scanned.

Assuming all is well, connect the two test points (TPA and TPB) together using the clip lead and adjust VR1 until a single LED is latched. Confirm this adjustment by unhooking and reconnecting the clip lead.

If the display does not latch when the test lead is reconnected, repeat the above procedure. This adjustment brings the vco to within the capture range of the PLL.

Note that, with the calibration control at mid-position, the latched LED should be the one at the top of the circle.

ANTENNAS AND OPERATION

For mobile operation, four 1/4-wave vertical whip antennas attached to a roof-rack assembly would be the best approach. The ASU could then be conveniently located between the antennas. It should be weather-proofed using a silicone sealant.

In most cases, a separate ground plane will have to be provided adjacent to the antenna bases. A suggested method is to secure a sheet of aluminum to the roof-rack. Make sure that the assembly cannot come loose!

A hand-held transceiver can be used to aid the initial setting-up procedure. Depending on the setup, it may be necessary to rotate the antenna array until the compass rose reads true relative to the direction of the vehicle.

The calibration control can be used to make the final adjustment. A walk around the antenna array with the hand-held transceiver will then reveal if the installation is functioning correctly. This should take place in an open area to avoid strong signal reflections.

In the case of a fixed installation, four ground-plane antennas should be mounted symmetrically on a vertical mast, together with the ASU. The array can then be adjusted so that the compass rose displays the true bearing with the calibration control set to mid-position.

Note that, in either case, the distance between opposing antennas should be between 0.07 and 0.4 wavelengths.

If a dual-trace oscilloscope is available, VR1 can be adjusted for a 90° phase angle between the signal input (pin 14, IC14) and the PLL comparator input (pin 3, IC14).

Finally, the control unit can be checked out by connecting outputs 1, 2, 3, and 4 (to the ASU) in sequence to test point TPA. First, connect output 1 to TPA and adjust the calibration control so that the latched LED is at 0°. The 90° LED should now light when output 2 is shorted, the 180° LED when output 3 is shorted, and the 270° LED when output 4 is shorted.

That completes the construction. Your Radio Direction Finder is now ready for use.

Where To Buy The Kit

The Radio Direction Finder described here was developed by the Research and Development Department at Dick Smith Electronics Pty Ltd. It is available as a complete kit of parts by mail order or from your nearest Dick Smith Electronics store.

The kit comes complete and includes a perspex front panel, screenprinted fiberglass PC boards, antenna bases, plugs and sockets, and a detailed construction manual. The cost is $99 plus postage and packing charges where applicable.

Mail orders should be sent to: Dick Smith Electronics, PO Box 8021, Redwood City CA 94063; (800)-332-5373. ■

MOVING?

SUBSCRIPTION PROBLEM?

Get help with your subscription by calling our new toll free number:

1-800-227-5782*

between 9 a.m. and 5 p.m. EST, Monday–Friday.

If possible, please have your mailing label in front of you as well as your cancelled check or credit card statement if you are having problems with payment.

If moving, please give both your old address and new address.

HOT!!

$129.95
(C64 Version)

Turn Your Computer Into A

DIGITAL STORAGE OSCILLOSCOPE

And More With The

MB230 WORKSHOP

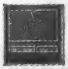
OSCILLOSCOPE

INTERFACE UNIT

The MB230 is designed for use with your home or personal computer. It is a complete Electronic Instrument and Electro-Mechanical Workshop which contains Interface Unit, D.C. Motors, Gears, Sensors, Construction Components, Disk Based Software and instructions for 50 sample projects.

Included are:

- Digital Storage Oscilloscope
- Digital Voltmeter
- Digital Speech & Sound (Record/Playback)
- A/D-D/A Conversion
- D.C. Motor Control (Var. Speed)
- Infrared Control
- Motors, Gears, Generators
- Motorized Mechanical Robotics
- Cars, Cranes, Toys, Etc.



VOLTMETER

MOTOR AND GEARS

The heart of the MB230 Workshop is the B100 Interface Unit which connects to all types of sensors and is able to control lights, motors, relays and other external devices. The MB230 manual contains suggestions and instructions for many advanced projects such as antenna positioning and relay control.

Available for the following computers:
Commodore 64 ($129.95), Apple 2+, 2E ($159.95),
Atari 800 ($139.95).
Coming soon for IBM, Amiga, Atari 520ST.

To order or for more information call toll free 1-800-824-2549.
Cashier's check, Money order, VISA, or Mastercard orders accepted.

Order now to avoid delay!

ALL ORDERS SHIPPED UPS BLUE
AT NO EXTRA CHARGE

✓84

MULTIBOTICS, INC.
2561 South 1560 West
Woods Cross, Utah 84087

Tally-Ho!

Be the first to find that hidden transmitter on your next Foxhunt!

Featured in this issue!

With the exciting new Dick Smith Electronics Radio Direction Finder you can locate the source of any transmission. The antenna switching unit (ASU) is connected by cable to the control/display & almost any FM receiver; the DF locks on to navigation beacons or radio signals and the 32 unit LED compass indicates transmission bearing to 6° accuracy. Why spend hundreds of dollars when you can build this kit and save! Includes detail construction manual & all necessary hardware for fixed or mobile installation. Antennas not included.

● 12V operation ● 50-500 MHz range ● 170 degree calibration
● Internal alignment reference ● Extremely stable digital circuitry
● Adjustable internal monitor speaker
● Self-aligning commutating filters

RADIO DIRECTION FINDER

only **$99**
Cat K-6345

$159
Cat K-6308

DSE 2M VHF TRANSCEIVER KIT

Nearly 2000 amateurs can't be wrong! In just a few months we've sold that many kits - and why not? Our specs surpass many commercial trancsceivers that cost far more! Includes step-by-step construction manual, mic, & mounting bracket - nothing more to buy!

Freq: 144-148 MHz in 10KHz steps (5khz offset)
Mode of operation: FM
Receiver: Dual conversion superheterodvne
Sensitivity: 0.5uV for 12dB quieting
Selectivity: Better than 60dB 25KHz
Supply Req: 13.8 VOC 2.5A (15W output)

GaAs FET Preamps

SPECIFICATIONS:
Gain: 20dB
Noise Index: 0.8dB
Intercept point: 15dBm
Supply: 8-15V
Connectors: BNC
VSWR: less than 1.5: 1
Size: 0.75"x1.5"x2.2"
Weight: 90g

$59.95 EACH

Cat D-2954	220 MHz
Cat D-2955	70cm/420-450 MHZ
Cat D-2456	2M/144-148 MHz

VISIT OUR RETAIL CENTERS!

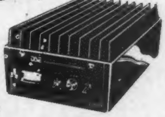
BERKELEY: 2474 Shattuck Ave.(415)486-0755
REDWOOD CITY: 390 Convention Way (415)368-8844
SAN JOSE: 4980 Stevens Creek Blvd. (408)241-2266
LOS ANGELES: 1830 Westwood Blvd. (213)474-0626
HEAD OFFICE: 390 Convention Way Redwood City,CA 94063

MAIL ORDERS:
P.O. Box 8021 Redwood City CA 94063

14 DAY MONEY-BACK GUARANTEE

We ship UPS Ground unless otherwise specified. Add 5% for shipping. ($1.50 min), 20% outside USA ($4 min) Add $1 for handling California residents please add sales, tax.

100W 2M Linear Amp Kit



Max Output: 120 W(c w) input @ 146 Mhz 13.8 VPC 15A
Harmonics: 2nd 5dB (same as exciter) 3rd: -65dB (same as exciter)
Intermod: 2nd: 55 B 2-tone (500 Hz/2400 Hz) -25 dB @ 200W P.E.P.
Insertion Loss: Over frequency range 144-148 MHZ : 0.6dB
Input VSWR: 1.2:1 over frequency range 144-148 MHZ
Power Input: 2W 5W 10W
Power Output: 43W 75W 110W

$149.95
Cat K-6313

Get Your 1986/87 DSE Catalog Now!

Send me the new 148 page catalog! Here's $1 for postage & handling.

Name ______
Address ______
City ______
State ______ Zip ______

DSE, P.O. Box 2249, Redwood City, CA 94063

DICK SMITH ELECTRONICS

ORDER TOLL FREE: 1-800-332-5373
IN CALIFORNIA CALL: 1-415-368-1066

Bill Clarke WA4BLC
Box 2403
Falls Church VA 22042

C-64 S-s-s-tutter Fix

WA4BLC tells you how to clean up its act.

I have two Commodore 64s and both have served me well. In fact, I have written six books and a large . . . well, you're not here to listen to all that, but I hope you are here to learn how to fix a small problem that develops with all C-64s at some point in time.

The problem appears first as a missed character, or perhaps as a repeat character, as you type. This is most noticeable when using the computer as a word processor or in RTTY applications. A good example might be:

"Well, guesss thatss abut all here, ssure d hpe to run int yu again. 73 frm WA4BLC in Fallss Church, VA."

Notice how, on some occasions, the letter "s" repeated itself and the letter "o" was missed completely. Both instances are examples of an intermittent problem inherent in the Commodore 64 (and other similar computers).

Background

The Commodore 64 keyboard is made up of typewriter-style key caps which, when depressed, push a small piece of conductive rubber against pads on a printed circuit board (PCB), causing momentary contact. This momentary contact is recognized by the computer, and the particular letter struck will appear on the screen. It is a simple, almost foolproof system giving excellent feel to the keyboard (I compare it favorably to an IBM typewriter), and it is almost immune to accidental strikes or even the occasional physical assault keyboards tend to get.

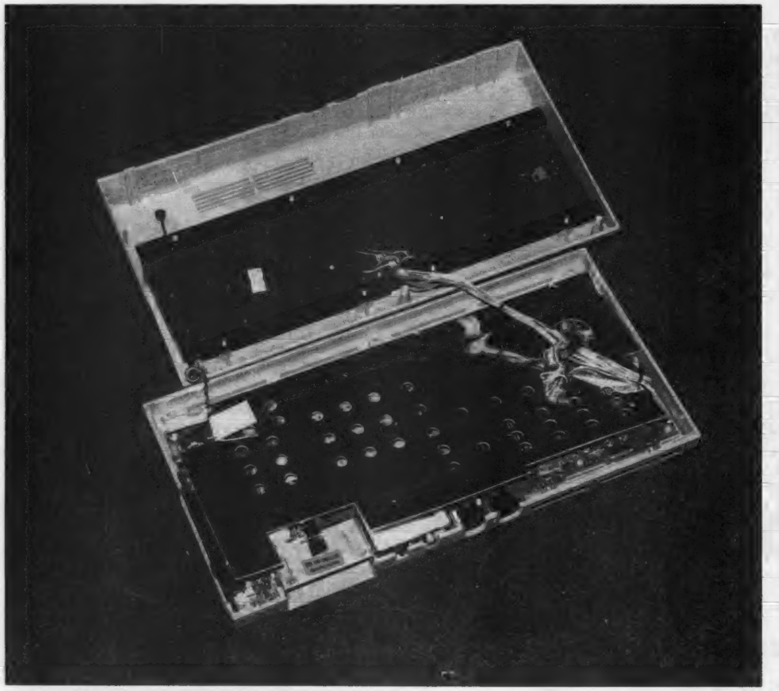


Photo A. Opened up, the bottom half, above, has the keyboard in it. Don't turn it over! Notice the wires referred to in the text that must be unplugged.

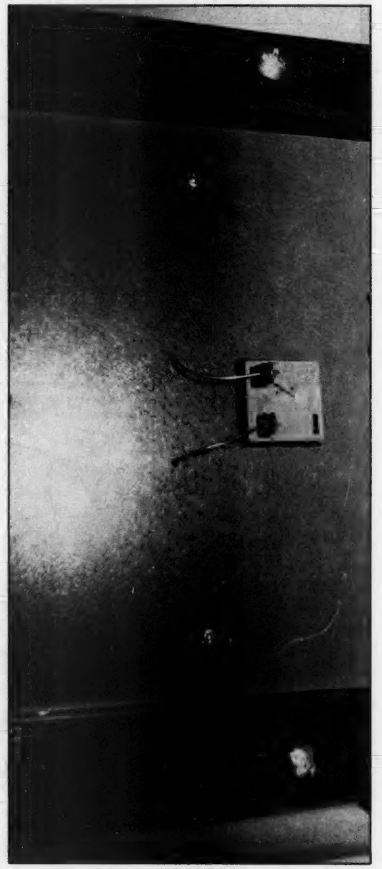


Photo B. These two wires must be unsoldered before disassembly of the keyboard PCB and resoldered when putting it back together.

DOCKING BOOSTER

Converts Your HT to a Powerful Mobile Unit

- 30 watts output
- GaAs FET pre-amp
- Fits on car door
- 2 Meters or 70 cm
- Icom
- Kenwood
- Yaesu

✓95

NAVAL ELECTRONICS, INC.
5417 Jetview Circle • Tampa, FL 33614
Phone: 813-885-6091 • Telex: 289-237 (NAVL UR)

SWL's: Are You Plagued By

Phantom Signals?

Range MHz
Tune
GROVE
MINITUNER·tun3

Meet the Eliminator.

Don't let its small dimensions (4"x3"x2") fool you—the Grove **Minituner III** is a big weapon against images, intermod and phantom signals on your shortwave receiver!

This short wave/long wave pre-selector is designed to boost performance in the 100 kHz-30 MHz frequency range. If you own one of the popular general coverage communications receivers and are using an outside antenna, you NEED this extra measure of selectivity.

No power required. Simply connect between your receiver and antenna. Equipped for standard PL-259 connections. **Only $39** (free UPS shipping; $5 U.S. Mail/P.P.).

✓71

Grove Enterprises
140 Dog Branch Road
Brasstown, N.C. 28902

Order TUN-3
MC, Visa or COD call:
1-800-438-8155

NEWS BULLETIN

we'll treat you RIGHT

Burghardt's INC. ✓92

AMATEUR CENTER

"AMERICA'S MOST RELIABLE AMATEUR RADIO DEALER"

For more than 40 years we have been serving the amateur community with QUALITY PRODUCTS and DEPENDABLE "S-E-R-V-I-C-E" and, we fully intend to carry on this proud tradition with even MORE new product lines plus the same "fair" treatment you've come to rely on. Our reconditioned equipment is of the finest quality with 30, 60 and even 90-day parts and labor warranties on selected pieces.

And, remember . . .

— WE SERVICE WHAT WE SELL —

AEA
AMECO
AMERITRON
ANTEK
ARRL
ASTRON
ANTENNA SPECIALISTS
B & W
BENCHER
BUTTERNUT
CUSHCRAFT
DIAWA
DRAKE
ENCOMM
HUSTLER
ICOM
JANEL
KANTRONICS
KDK
KLM
LARSEN
MFJ
MINI-PRODUCTS
MIRAGE
MOSELEY
NYE
PALOMAR
RADIO CALLBOOK
ROBOT
ROHN
TELEX / HYGAIN
TEN-TEC
TRIO-KENWOOD
UNADILLA / REYCO
YAESU

Write today for our latest Bulletin/Used Equipment List.

SELECTION

S-E-R-V-I-C-E

and

SATISFACTION!

STORE HOURS:
9-5 P.M. (CST)
MONDAY thru FRIDAY
OPEN SATURDAYS
from 9-1 P.M. (CST)
CLOSED
SUNDAYS/HOLIDAYS

MAIL AND TELEPHONE ORDERS "WELCOMED" . . They're our business!!

MasterCard VISA

P.O. Box 73
208 East Kemp
Watertown, SD 57201

SELL-TRADE

New & Reconditioned

HAM EQUIPMENT

Call or Write Us Today For a Quote!
You'll Find Us to be Courteous, Knowledgeable and Honest

PHONE (605) 886-7314

Advanced Electronic Applications, Inc
STATUS
TUNE
MODE
AMTOR TERMINAL UNIT
MODEL AMT-1

AEA AMT-1. REGULARLY $479.95

NOW ONLY $299.95

THE **AMTOR TERMINAL UNIT!!!** Works with any ASCII terminal or personal computer with a terminal program. Also works RTTY, CW, ASCII.
ORDER YOURS TODAY! *Limited quantities.*

However, not all is perfect, and from time to time the 64's keyboard will start to skip and stutter, driving the operator up the proverbial wall. After all, we do want our typing and RTTY to be letter-perfect, don't we?

These skips and stutters are caused by a film of oxidation forming on the contact surfaces of the keyboard's PCB. This film prevents the forming of a complete circuit when the conductive rubber contacts the PCB pads.

There are two methods of repair. The first is to take the computer to a repair center, pay the price, and wait the time. The second is to repair it yourself.

Fixing It Yourself

The following instructions are so simple that anyone with the ability to read, to handle a screwdriver, and to solder should be able to repair his own Commodore 64 keyboard.

I recommend you use a small size Phillips screwdriver for work inside the computer (Radio Shack sells kits of small tools) and a cereal bowl for the collection of parts. Use a low-wattage soldering iron—no 250-Watt guns allowed.

1) Disconnect all lines, wires, plugs, etc., from the computer and place it on your working surface with the keys facing away from you.

2) Turn the computer upside down (space bar now underneath and toward you) and remove the three screws along the edge closest to you. After the screws have been removed, lift up the bottom panel until it feels as if it is binding. This binding is caused by three snap-in latches on the back of the computer. Continue to open the computer, and these latches will snap open.

Do not turn the keyboard half of the computer shell over! Leave it face down. If you do turn it over, you will have enough pieces falling and scattering to keep you busy for several hours picking them up and putting them back where they belong!

3) Now that the computer is in two pieces, position them as shown in Photo A, with the insides of each half face up, and the half with the aluminum-foil shield closest to you.

4) Looking at the half of the computer farthest from you, you will see a long, brown printed circuit board. This is the keyboard PCB. On the left side you will see the pair of wires (red and black) which run from the pilot lamp to the bottom of the computer. Unplug this line.

5) Now look at the center of the keyboard PCB and you will see a multicolored bunch of wires. Follow these wires to where you will see them terminate with a plug. Unplug this plug also.

6) Looking on the right side of the circuit board, you will see two bare wires soldered to two lugs. Unsolder these and carefully pull them out of the lugs (see Photo B).

7) Looking at the keyboard PCB, you now will notice 23 small screws, some covered with tape. Remove the tape. Then carefully remove all 23 of the screws (place the screws in the bowl).

8) The keyboard PCB is now free of all connection. Carefully lift it from its mounting and turn it over. The circuit side is green. It is the green side that must be cleaned.

Photo C. Carefully and gently scrub the pads, as instructed in the text.

9) At the kitchen sink, carefully wet the printed circuit side of the PCB and spread about a tablespoon of mildly abrasive bathtub cleaner (the type used on fiberglass showers) over the surface. In addition to the circuit traces on the PCB, you will notice there are many small pads on the board, each about 1/4-inch square. These pads are the key-contact points that need to be cleaned. Using your fingers as scrubbers, lightly scrub each of these pads. Three or four times across each pad will be sufficient (see Photo C).

10) Rinse the circuit board with lots of cool water, then pat dry with a linen towel (linen will not leave any lint). Let the board sit in a cool, dry location for at least three hours to ensure proper drying.

11) Before reassembly, carefully blow the inside of the keyboard shell clear of any accumulated dust and dirt. This can be done with a hairdryer. About 10 seconds of air blast is all that's needed. This short blast will not allow any heat buildup.

12) Place the keyboard PCB back into place in the upper half of the computer, brown side up. There are small round tabs in each corner of the board to aid in alignment. After the circuit board is in place, insert and tighten each of the 23 screws. Do not over-tighten!

13) Resolder the two wires into their respective lugs and plug in the pilot lamp wires and keyboard wire bunch plug. (These plugs are designed to fit only one way, so don't force them.)

14) Place a piece of tape over the group of wires in the center of the PCB. Shipping tape is excellent for this job.

15) Carefully fit the top and bottom parts together, starting with the tabs on the back; reinstall the three bottom screws.

Summary

Well, you may not be a computer service master now, but you surely found a way to save a few dollars. In fact, the dollars saved range from $35 to $95, depending upon where you live and where you take your equipment for servicing.

By the way, dampness and tobacco smoke are the two worst enemies your computer has. Neither is too good for us either! ■

BACK ISSUES

February 1986
HT accessories, more VIC-20 RAM, TR-2400 scanning, FT-101E RIT

March 1986
Wayne's back, extra FT-107 memories, speed dialer, digital IC trainer

April 1986
Stacked vee-beams, curved linear array, Dayton Hamvention, project potting

May 1986
Universal digital frequency display, hula hoop loop, W2NSD/1 on Lids

June 1986
Dirt cheap microwaves, 2 to 10, classic K2ORS humor

You'll also enjoy all of our regular features. Each back issue costs $3.50 plus $1.00 shipping and handling. On orders of 10 or more back issues, there is a flat $7.50 shipping and handling fee. Send your check or money order to 73, Attn: Back Issue Orders, WGE Center, Peterborough NH 03458-1194.

RAMSEY

THE FIRST NAME IN ELECTRONIC TEST GEAR

$30.00 OFF

Save $30 on the RAMSEY 20MHz Dual Trace Oscilloscope

Unsurpassed quality at an unbeatable price, the Ramsey oscilloscope compares to others costing hundreds more. Features include a component testing circuit for resistor, capacitor, digital circuit and diode testing • TV video sync filter • wide bandwidth & high sensitivity • internal graticule • front panel trace rotator • Z axis • high sensitivity x-y mode • regulated power supply • built-in calibrator • rock solid triggering

Was $399.95 NOW ONLY $369.95 high quality hook on probes included

NEW RAMSEY 1200 VOM MULTITESTER

Check transistors, diodes and LEDs with this professional quality meter. Other features include, decibel scale • 20K volt metering system • 3½" mirrored scale • polarity switch • 20 measuring ranges • safety probes • high impact plastic case

$19.95 test leads and battery included

NEW

RAMSEY D-4100 COMPACT DIGITAL MULTITESTER

Compact sized reliability and accuracy. This LCD digital multitester easily fits in your pocket, you can take it anywhere. It features full overload protection • 3½ digit LCD readout • recessed input jacks • safety probes • diode check function • 2000 hours battery life

$22.95 test leads and battery included

MINI KITS—EASY TO ASSEMBLE, FUN TO USE BEGINNERS & PROS WILL HAVE A GREAT TIME WITH THESE KITS

FM MINI MIKE

A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.

FM-3 Kit	$14.95
FM-3 Wired and Tested	19.95

Color Organ

See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110VAC.

Complete kit, ML-1 $8.95

Video Modulator Kit

Converts any TV to video monitor. Super stable, tunable over ch 4-6. Runs on 5-15V accepts std. video signal. Best unit on the market! Complete kit, VD-1 $7.95

Led Blinky Kit

A great attention getter which alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights, anything! Runs on 3 to 15 volts.

Complete kit, BL-1 $2.95

Super Sleuth

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker.

Complete kit, BN-9 $5.95

CPO-1

Runs on 3-12 Vdc 1 wall out, 1 KHZ good for CPO, Alarm, Audio Oscillator. Complete kit $2.95

FM Wireless Mike Kit

Tansmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 Kit $3.95 FM-2 Kit $4.95

Whisper Light Kit

An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.

Complete kit, WL-1 $6.95

Tone Decoder

A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.

Complete kit, TD-1 $5.95

Universal Timer Kit

Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

UT-5 Kit $5.95

Mad Blaster Kit

Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC

MB-1 Kit $4.95

Siren Kit

Produces upward and downward wail characteristic of a police siren. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.

Complete kit, SM-3 $2.95

60 Hz Time Base

Runs on 5-15 VDC. Low current (25ma) 1 min/month accuracy TB-7 Kit $5.50

TB-7 Assy. $9.95

30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4 W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 30 W pwr amp kit	$22.95
TR-1, RF sensed T-R relay kit	6.95

Power Supply Kit

Complete triple regulated power supply provides variable 6 to 18 volts at 200 ma and +5 at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6 3V (a 1 A and 24 VCT. Complete kit, PS-3LT $6.95

NEW **35 MHz DUAL TRACE OSCILLOSCOPE**

A heavy duty and accurate scope for service as well as production use. Features include • wide frequency bandwidth • optimal sensitivity • extremely bright display • delayed triggering sweep • hold off • ALT trigger • single sweep • TV sync • 5X magnification • XY or XYZ operation • HF/LF noise reduction

3500 Dual Trace Oscilloscope

$499.95 Includes 2 high quality probes

ALL OSCILLOSCOPES INCLUDE 2 PROBES

NEW **15 MHz DUAL TRACE PORTABLE OSCILLOSCOPE**

Ideal for field/bench applications, this scope can display up to 15 MHz signals. Internal battery pack allows up to 2 hours operation on a single charge. Features include • built-in battery charger • 5X horizontal magnification • high brightness CRT • front panel trace rotator • internal rechargeable battery pack

2500 Portable Oscilloscope

$449.95 Includes 2 high quality probes

MINI-100 FREQUENCY COUNTER

Features and capabilities of counters costing twice as much • compact • high sensitivity • low current drain • very accurate • leading zero blanking • field or shop use • 1 MHz to 500 MHz range • diode protected • 7 digit display

$99.95 BATTERY CHARGER NICAD BATTERIES AND AC ADAPTER INCLUDED

CT-70 7 DIGIT 525 MHz COUNTER

Lab quality at a breakthrough price. Features • 3 frequency ranges each with pre amp • dual selectable gate times • gate activity indicator • 50mV @ 150 MHz typical sensitivity • wide frequency range • 1 ppm accuracy

$119.95 wired includes AC adapter

CT-70 kit	$99.95
BP-4 nicad pack	8.95

CT-50 8 DIGIT 600 MHz COUNTER

$169.95 wired

CT-50 kit	$139.95
RA-1 receiver adapter kit	14.95

CT-90 9 DIGIT 600 MHz COUNTER

The most versatile for less than $300. Features 3 selectable gate times • 9 digits • gate indicator • display hold • 25mV @ 150 MHz typical senstiivity • 10 MHz timebase for WWV calibration • 1 ppm accuracy

$149.95 wired includes AC adapter

CT-90 kit	$129.95
OV-1 0.1 PPM oven timebase	59.95
BP-4 nicad pack	8.95

CT-125 9 DIGIT 1.2 GHz COUNTER

$169.95 wired includes AC adapter

BP-4 nicad	$8.95

DM-700 DIGITAL MULTIMETER

Professional quality at a hobbyist price. Features include 26 different ranges and 5 functions • 3½ digit, ½ inch LED display • automatic decimal placement • automatic polarity

$119.95 wired includes AC adapter

DM-700 kit	$99.95
MP-1 probe set	4.95

PR-2 COUNTER PREAMP

The PR-2 is ideal for measuring weak signals from 10 to 1,000 MHz • flat 25 db gain • BNC connectors • great for shifting RF • ideal receiver/TV preamp

$44.95 wired includes AC adapter

PR-2 kit	$34.95

PS-2 AUDIO MULTIPLIER

The PS-2 is handy for high resolution audio resolution measurements, multiplies Up in frequency • great for PL tone measurements • multiples by 10 or 100 • 0.01 Hz resolution & built-in signal preamp/conditioner

$49.95 wired

PR-2 kit	$39.95

PS-10B 1 GHz PRESCALER

Extends the range of your present counter to 1 GHz • 2 stage preamp • divide by 1000 circuitry • super sensitive (50 mV typical) • BNC connectors • 1 GHz in, 1 MHz out • drives any counter

PS 10-B Prescaler **$79.95**
wired includes AC adapter

ACCESSORIES FOR RAMSEY COUNTERS

Telescopic whip antenna—BNC plug	$ 8.95
High impedance probe, light loading	16.95
Low pass probe, audio use	16.95
Direct probe, general purpose use	13.95
Tilt bail, for CT-70, 90, 125	3.95

VISA MasterCard

PHONE ORDERS CALL
716-586-3950
TELEX 466735 RAMSEY CI

TERMS: • satisfaction guaranteed • examine for 10 days; if not pleased, return in original form for refund • add 6% for shipping and insurance to a maximum of $10.00 • overseas add 15% for surface mail • COD add $2.50 (COD in USA only) • orders under $15.00 add $1.50 • NY residents add 7% sales tax • 90 day parts warranty on all kits • 1 year parts & labor warranty on all wired units

RAMSEY

RAMSEY ELECTRONICS, INC.
2575 Baird Rd.
Penfield, N.Y. 14626

NEVER SAY DIE

from page 12

me, I'll drop your card like stink. Play it fair and square.

Remember, many of our advertisers are hams much like you—except they, in a weak moment, let themselves be talked into going into the ham business. Have pity. Read their ads—circle their numbers—read their literature and let your heart be your only guide. No ham worthy his salt lets his meager pocketbook slow him down. . . right? Remember, the one who dies with the most toys wins. Are you a winner?

A CONFLICT OF INTEREST

Packet radio is looking more and more like the next really big movement in amateur radio—the first since FM and repeaters 15 years ago. But packet has its promoters and its detractors, both with persuasive arguments.

On the plus side, packet requires little expense to be implemented—just your average ham transceiver, a computer, and a packet converter. You really should give it a try. Look over the packet ads in this issue and get cracking.

Okay, now to one of the major problems with packet radio—with the hope that you or your club can come up with some solutions. The FCC has two fundamental rules which they consider important. The first is that anyone transmitting on the ham bands should be licensed. The second is that the ham bands should not be used for commercial communications.

Both are concepts I think we can manage to live with, no matter how frustrating they may be to some amateurs. The problem with packet radio has to do with automatic relaying of messages, often with no record kept of traffic passing through. How can we then be sure that our system isn't used by non-licensed operators? And how can we keep commercialism at bay?

Sure, if relay stations checked out all relayed traffic, we'd have a pretty safe system. But as the volume of traffic passing through builds up, we know darned well that relay stations aren't going to bother reading all the mail. . . or even logging it. Given that inevitability, there will be little control over the use of our networks. Indeed, anyone with a home computer and an inexpensive two-meter rig (which anyone can own) could easily become a regular user with little likelihood of being noticed.

The security of being lost in a crowd would certainly tend to encourage some amateurs (or even non-amateurs) to step over the line of commercialization.

These are things to think over as packet grows in its popularity. The relay station handling a few dozen messages will have plenty of time to read the mail, but as it gets to thousands a day we're going to need some other system of checking.

One possibility might be to encourage relay stations to set up a separate computer just to keep track of relay traffic. They would then have a log of the number of messages handled, the calls originating them, the addressee calls, and the number of bytes relayed. By saving all traffic on a hard disk for a few days they would be able to check out traffic from newcomers to the net, frequent net user traffic, and so on. It isn't perfect, of course, but the knowledge that someone is likely to check out the traffic should act as a lid to discourage illegal use of the system.

The use of 8mm digital video tape to store relayed traffic would make a relatively inexpensive medium for mass storage. We're talking about around two gigabytes of storage per tape cassette. If we figure most messages will be less than one kilobyte, we'll have room for around a million messages per tape. That should hold even a busy relay station for a while.

A new digital audio tape technology is almost upon us—R-DAT, it's called. With this we'll have room for even more data than the 8mm video cassettes, yet they're much smaller than our regular audio cassettes. The 8mm cassettes are about the same size as audio cassettes.

Even our new picocomputers are coming with 3.5" disk drives built in these days. Modern technology allows us to put about one megabyte on these disks, with the promise of 15 megabytes soon. The permanent storing of all traffic shouldn't be a problem for long.

But this is something for our packet fanatics to think about and solve. What say you?

SO WAYNE'S BACK. . . SO?

Let's see, you may be interested in what happened at Orlando—where a lot happened. A whole lot, actually. Golly, where to start? Well, it was a big hamfest—bigger than Miami, I'll bet. Huge indoor flea market. Again, as at Miami, well over a thousand hams stopped by the *73* booth to welcome me back to the magazine. This made me and the whole staff feel good—thanks.

My return to *73*—and I've a bunch more to say about that—was pretty late for the Orlando hamfest to get the word out that I was on their program. I got some flack later on from disappointed hams who missed my talk through a lack of publicity from the hamfest committee. Being so late to get on the program, I had to settle for what they had left in time slots, which wasn't much, and almost no PR.

No, I'm not faulting Ed Huber, the show honcho, who did surprisingly well under very difficult circumstances. My own tendencies toward paranoia are difficult to ignore because every now and then someone leaks the information that "they" really *are* out to get me. For instance, at Orlando I was informed by Al that I'd have an hour and a half to talk, starting at 10 a.m. The show opened at 9, so I knew I'd miss maybe half or more of my possible audience who wouldn't even be there yet. I was not as pleased as you may think to find, on my arrival at a couple minutes to nine, that my talk had mysteriously been changed to 9. Since they didn't even open the doors so people could look it up in a program booklet until 9 a.m., I didn't expect much of a turnout. I was right.

Worse, when I went to the room for my talk, I discovered it had been changed to a different floor. By 9:30 I finally found myself outnumbered and started talking, pacing my talk for an hour instead of an hour and a half. About half way into my talk a chap stuck his head in the door and yelled to say I had to get out because he had the room at 10. Sigh. . . they've done it again!

I polled the small group who did find my talk and found that about a third of them were already active on packet radio. . . and another third were interested. Not exactly a cross-section of amateur radio, but more a cross-section of *73* readers. I'm aiming to have a good deal of information on packet. . . stay tuned.

Epcot

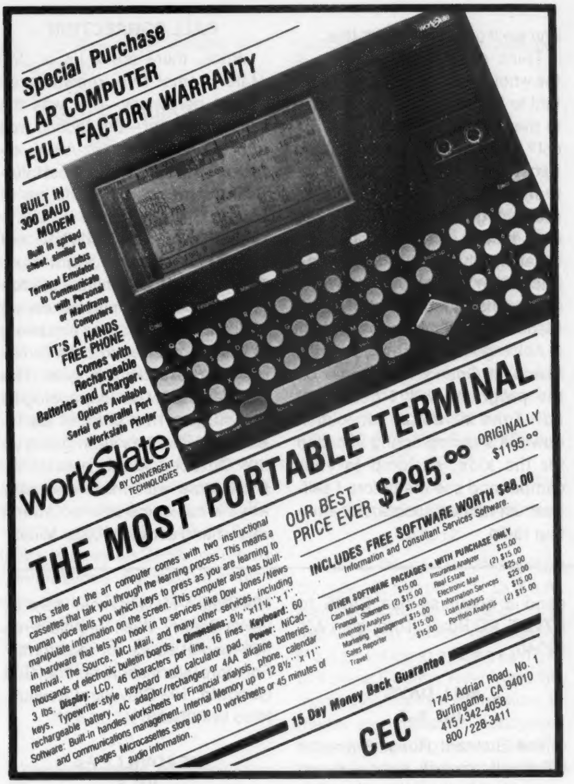
One of the big plusses of Orlando over Miami is the proximity of Disney World and Epcot Center. Since I've visited Disneyland in both Anaheim and Tokyo, I wanted to complete my Disney excursions. I got to the Orlando hamfest a day early and stayed a day late so I could do both Epcot and D World—which I did. No complaints as both were well worth the time.

One thing really disappointed me about the Disney complex—*no* ham activity. If there's any place in the U.S. where amateur radio should have a high profile, it's at Epcot. What a bummer! I met the ham involved with the Disney ham effort and found that he has had little support from the management so far. He mentioned a 7.03 repeater, but I was unable to raise it while there.

The next time I get to Washington I'm going to visit the Florida senators and explain the importance of amateur radio at Epcot. With their support I'll bet I'll be able to get to see the Disney management and explain the benefits to Epcot of having a first-rate ham station.

I talked with Kenwood, ICOM, and Yaesu about supporting a ham exhibit at Epcot and found them all most supportive. I don't know how many millions of people go through Epcot a year, but if the day I was there was typical, it's a bunch—about 50,000 a day. There were lines over a half hour long at the more interesting exhibits. The smart thing to do, as I figured out later, is to head for the country exhibits, which are toward the back end of Epcot and thus not jam packed right after opening time—then move toward the popular exhibits in the afternoon when the lines are short or even nonexistent. Live and learn.

Epcot is like a permanent world's fair. There are enough first-rate exhibits to keep you busy every minute for a complete day. If you sucker in on the long lines it'll take more than a day. You won't want to miss some of the interesting restaurants either. . . for instance, perhaps you've led a sheltered life and haven't ever eaten cous-cous, a Moroccan dish. You'll be able to give it a try while



Special Purchase

LAP COMPUTER

FULL FACTORY WARRANTY

BUILT IN 300 BAUD MODEM

Built in spread sheet, similar to Lotus

Terminal Emulator to Communicate with Personal or Mainframe Computers

IT'S A HANDS FREE PHONE

Comes with Rechargeable Batteries and Charger.

Options Available Serial or Parallel Port Workslate Printer

workSlate BY CONVERGENT TECHNOLOGIES

THE MOST PORTABLE TERMINAL

OUR BEST PRICE EVER $295.00 ORIGINALLY $1195.00

This state of the art computer comes with two instructional cassettes that talk you through the learning process. This means a human voice tells you which keys to press as you are learning to manipulate information on the screen. This computer also has built-in hardware that lets you hook in to services like Dow Jones/News Retrival. The Source, MCI Mail, and many other services, including thousands of electronic bulletin boards. • **Dimensions:** 8½"x11¼"x 1". 3 lbs. **Display:** LCD, 46 characters per line, 16 lines. **Keyboard:** 60 keys. Typewriter-style keyboard and calculator pad. **Power:** NiCad-rechargeable battery. AC adaptor/rechanger or 4AA alkaline batteries. Software: Built-in handles worksheets for Financial analysis, phone, calendar and communications management. Internal Memory up to 12 8½" x 11" pages Microcassettes store up to 10 worksheets or 45 minutes of audio information.

INCLUDES FREE SOFTWARE WORTH $88.00

Information and Consultant Services Software.

OTHER SOFTWARE PACKAGES • WITH PURCHASE ONLY

Cash Management	$15.00	Insurance Analyzer	$15.00
Financial Statements	(2) $15.00	Real Estate	(2) $15.00
Inventory Analysis	$15.00	Electronic Mail	$25.00
Marketing Management	$15.00	Information Services	$25.00
Sales Reporter	$15.00	Loan Analysis	$15.00
Travel		Portfolio Analysis	(2) $15.00

15 Day Money Back Guarantee

CEC

1745 Adrian Road, No. 1
Burlingame, CA 94010
415/342-4058
800/228-3411

NEMAL ELECTRONICS

Your Authorized Distributor For COOPER INDUSTRIES BELDEN

INTRODUCTORY SALE!

Belden No.	Nemal No.	Description	Per 100 ft.	Per ft.
8214	1102B	RG8 /U Foam 96%	$45.00	.50
8237	1100B	RG8/U Poly 96%	39.00	.44
8241	1500B	RG59/U Poly 96%	13.00	.15
8267	1130B	RG213/U Poly 96%	53.00	.59
9269	1600B	RG62A/U Poly 96%	15.00	.17
8216	1450B	RG174/U Poly 96%	12.00	.14
9913	1180	Low Loss 50 Ohm	46.00	.58

OTHER QUALITY CABLES

Nemal No.	Description	Per 100 ft.	Per ft.
1110	RG8X 95% Shield (mini 8)	15.00	.17
1130	RG213/U Mil Spec. 96% Shield	34.00	.36
1140	RG214/U Mil Spec. - Silver	155.00	1.65
1705	RG142B/U Teflon - Silver	140.00	1.50
1310	RG217/U 5/8" 50 Ohm Dbl. Shld.	80.00	.85
1470	RG223/U Mil Spec. - Silver	80.00	.85
ROTOR CABLE — 8 COND.			
8C1822	2-18 Ga., 6-22 Ga.	19.00	.21
8C1620	2-16 Ga., 6-20 Ga. Heavy Duty	34.00	.36
HARDLINE — 1/2"			
FXA12	Smooth Alum. w/black jacket	79.00	.89
FLC12	Corrug'd. Copper (EQ. Heliax LDF)	159.00	1.69
CONNECTORS — MADE IN U.S.A.			
NE720	Type N for Belden 9913		4.75
PL259	Standard Plug for RG8, 213		.65
PL259AM	Amphenol PL259		.89
PL259TS	PL259 Teflon/Silver		1.59
UG21D	Type N for RG8, 213, 214		3.00
UG175	Adapter for RG58		.22

Call or write for complete Price List

Shipping: *Cable — $3.00 per 100 ft.*
Connectors — and 10%, $3.00 minimum

COD add $2.00.
Florida Residents add 5%.
Orders under $20 Add $2 Handling

Nemal's new 32-page Cable & Connector Selection Guide now available at no charge with orders of $50 or more or at a cost of $4.00 individually.

NEMAL ELECTRONICS

12240 N.E. 14th Ave., Dept. S., Miami, FL 33161
Telephone (305) 893-3924

✓50

Just what you've been asking for, an affordable subscription price to the liveliest, most useful ham magazine you can buy! Send in the coupon and get started with *73*. For only $25 (U.S.), **a savings of 33%**, you've got my guarantee: Either you enjoy *73* or you can ask for your money back! —Wayne Green W2NSD/1, Editor/Publisher.

Calling Canada, Mexico!
Start Saving with the next issue of *73* at the new, low rate of $25.00! (US)

Yes! Enter my subscription to *73* Magazine starting with the next issue. At the new low price of $25.00 U.S.

Name________________________________

Call________________________________

Address______________________________

City________________________________

☐Check ☐Money Order ☐AMEX ☐Other

#________________________________

Expiration date:________________________

73 Magazine WGE Center Peterborough, NH 03458 USA

JOIN US FOR THE GROWTH OF AMATEUR RADIO!

73 MAGAZINE
W2NSD
WAYNE
VISIT
SABA
MALAYSIA
ASSOC

you're in the Moroccan exhibit. Mmmm.

The 360-degree film in the Chinese exhibit is another must. Spectacular.

If you have any connections which might help us get a ham radio exhibit going at Epcot, please let me know. I'll bet this will take all the clout we can muster. We're going to have to emphasize the benefits to Epcot—how it will help attract the 415,000 hams and their families to the complex—how our advanced amateur radio technologies such as packet radio and OSCAR communications are just what Epcot is all about...people and the future. The Epcot managers should recognize that the key to the future IS communications, and the key to America's future lies in getting youngsters interested in self-education in electronics—just what amateur radio is really about.

The cost to Epcot need not be much more than their current budget. I'm sure we can get the ham industry to provide the equipment and get it installed. One good tech (which they already have on staff) is all that's needed to keep it going and to orient the visiting amateurs. The station operation can be done entirely by visitors. It might be possible to get a major firm as a sponsor, like we almost did with Coca Cola at the New York World's Fair a few years ago.

So, if you know anyone I should talk to about this, please don't make me ask twice. Drop me a note—tell them I'll be in touch—and we'll get moving with this.

Think about it—where else in the whole country is it more important to have amateur radio visible to the general public than at Epcot? And if you look at it from the Epcot view, American radio amateurs are precisely the demographic group they're looking for—middle income families on vacation. The hams will be taking back their Epcot/Disney World slides and videos to show their friends and neighbors.

Am I going to see you next March at Orlando? Will I be on the program? Will I get shafted? Tune in. Better yet, c'mon down! It's during spring vacation for the kids, so jump in your camper and see me before I self-destruct with enthusiasm for amateur radio.

CALL CORRECTION

Whoo, there are a lot of Don Miller hams! I've known three of 'em personally—one was the renowned DXer—the second was into SSTV and an ex-ARRL director—the third was a most interesting American ham living in Mexico City.

The DXer was W9WNV, not W9NTP. Someone mentioned that W9WNV committed suicide recently, but if so I missed hearing about it. I'd heard about him being in jail—something to do with hiring a chap to kill his wife. The SSTVer is W9NTP—my apologies for mixing the similar calls. SSTVer Miller has been going on the October Asian electronic show tours with me...probably why his call came to mind when I was writing about ex-DXer Miller.

SPECIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial offices, 73 Magazine, WGE Center, Peterborough, NH 03458-1194.

ACB 50TH
JUN 29–JUL 5

The ACB Radio Amateurs, a special-interest affiliate of the American Council of the Blind, will operate special-event station KW4U from 0000 UTC on June 29 until 2400 UTC on July 5 from the Hilton Hotel in Nashville, Tennessee, the sight of the ACB's silver anniversary convention. Operation will be 80 through 10 meters: 30 kHz from the bottom of CW bands; 5 kHz from the bottom of phone bands (±QRM). For a commemorative certificate, send a QSL to John McCann K4WU, 2105 W. Illinois Street, Arlington VA 22205.

WOODSTOCK 300TH
JUL 4

The Eastern Connecticut ARA will operate special-event station K1MUJ on July 4 from 8 a.m. to 5 p.m. EDT to celebrate the Woodstock, Connecticut, Tercentenary. Operation will be 80 through 10 meters: 40 kHz from the bottom of the CW bands, ±10 kHz from the center of the General phone bands, and packet (frequency and digipeater to be announced on W1AW BBS). Talk-in on 147.225/.825 or 146.52. For a commemorative certificate, send an SASE and QSL card to Tom Francis KB1SP, 73 Second Island Road, Webster MA 01570.

HARRISBURG PA
JUL 4

The Harrisburg RAC will hold its annual Firecracker Hamfest on July 4. Take Exit 1 off of Interstate 238 to Route 441 to the Bressler FC Picnic Grounds. Talk-in on .52. $3 admission. Tailgating free. Tables available. For more information, call Dave KC3MG at (717)-939-4957.

FORT LARAMIE
JUL 4–5

The High Plains ARC will operate special-event station K7YPT at Historic Fort Laramie from 0000 UTC July 4 until 0000 UTC July 5. Frequencies: phone—3.850, 7.250, 14.250, 21.360, and 28.550; CW—50 kHz up from the lower band edges. For a QSL, send a business-size SASE to K7YPT, PO Box T, Torrington WY 82240.

MILL DAYS
JUL 4–5

The Buzzard Roost Repeater Club will operate special-event station WB0UPK from 1500 UTC July 4 to 0100 UTC July 5. This event takes place at the Neligh Mills state historical site in conjunction with the Mill Days festival. Suggested operating frequencies: 3.950, 7.250, 14.295, 21.425, and 28.600 MHz. To obtain a QSL, send an SASE to WB0UPK, 804 East 1st Street, Neligh NE 68756.

SPIRIT FESTIVAL
JUL 4–5

The Heart of America RC and the Johnson County RAC will operate special-event stations from the Kansas City Spirit Festival on July 4–5, from 1800 to 0000 UTC both days, at the Soldiers and Sailors Liberty Memorial in Kansas City, Missouri. The station call for July 4th is W0RR; for July 5th it is W0ERH. Frequency is 7.225 MHz, phone only. Talk-in on 147.27/.87. Admission is $2. The public will be invited to operate the stations under club supervision, so Q-signals are discouraged. QSL via W0RR and W0ERH, PO Box 93, Shawnee Mission KS 66201.

WESTON WV
JUL 4–6

The 27th annual West Virginia State ARRL Convention will be held on July 4–6 at the Jackson's Mill State 4-H Camp near Weston, Lewis County, West Virginia. Free flea-market space for registrants. For more information, contact Sue Goodwin, 103 Cleveland Avenue, Nitro WV 25143.

MEADVILLE PA
JUL 5

The Crawford ARS will sponsor the Firecracker Hamfest on June 5, beginning at 8 a.m., at the Meadville Recreation Center, just off Route 27 E in Meadville, Pennsylvania. Admission is $2; children are free. Swimming costs extra (two pools). Indoor flea-market space is free—bring your own table. Talk-in on 144.53/145.13. For more information, write CARS Hamfest '86, PO Box 653, Meadville PA 16335, or call Ben Ferer KF3F at (814)-724-2432.

TOM SAWYER DAYS
JUL 5–6

The Hannibal (MO) ARC will operate special-event station W0KEM from the Tom Sawyer Days celebration on July 5–6, from 1500 to 2100 UTC both days. Frequencies: phone—7.245, 14.290, 21.400, and 28.770; CW—7.125 and 21.125. For a certificate, send a 9 x 12 SASE and QSL to W0KEM, RR 1, Box 55A, Payson IL 62360.

DOUGLAS WY
JUL 11–13

The Wyoming Hamfest will be held on July 11–13 at the Wyoming State Fairgrounds, Douglas, Wyoming. Amateur exams will be given. For more information, Send an SASE to 1986 Wyoming Hamfest, PO Box 3842, Gillette WY 82716-0390.

SAN ANTONIO TX
JUL 11–13

The Texas State ARRL and Texas VHF/FM Society joint convention will take place at the El Tropicano Hotel on July 11–13, beginning at 6 p.m. Friday, from 8 a.m. to 5 p.m. Saturday, and from 9 a.m. to 12 p.m. Sunday. ARRL forum, amateur swap, dealer/manufacturer displays, and preregistered license exams. Convention registration: $5 advance, $7 at door, family $2 advance, $3 at door. Amateur swap tables $5. Talk-in on 148.66 simplex. Send advance reservations to PO Box 18506, San Antonio TX 78218; (512)-698-1712 or 698-0560. Include an SASE for return confirmations. For more information, contact Melvin H. Anderson, Jr. WB5NOL, 8932 Saddle Trail, San Antonio TX 78255; (512)-698-1712 or 698-1714.

PLEASANT GAP PA
JUL 12

The Nittany ARC will hold its annual Mt. Nittany Ham Festival July 12 from 8 a.m. to 4 p.m. at the Firemen's Carnival Grounds in Pleasant Gap, Pennsylvania, 10 miles north of State College off Route 26. Admission is $3 per ham or $5 for flea-market space. Spouses and children free. Talk-in on 146.16/.76 from the north and west; 146.25/.85 from the south and east, and 146.52. For further information, contact Chuck McMullen K3CM, 7 Holly Circle, State College PA 16801.

PETOSKEY MI
JUL 12

The Straits Area ARC will hold a computer demonstration and swap and shop on July 12, from 9 a.m. to 2 p.m., at the Petoskey, Michigan, Fairgrounds. $2.50 donation at the door. Eight-foot table, $3. Splits allowed. Talk-in on .52 and .07/.67. For more information, contact Irene Stein N8HBT or Joe Werden WD8MJB at 4487 Robinson, Pellston MI 49769; (616)-347-8693.

EAU CLAIRE WI
JUL 12

The Eau Claire ARC will hold its annual hamfest on July 12, from 8 a.m. to 4 p.m., at the 4-H Buildings in Eau Claire, Wisconsin. Tickets are $3. For more information, send an SASE to Gene Lieberg KA9DWH, 2840 Saturn Avenue, Eau Claire WI 54703.

OAK CREEK WI
JUL 12

The South Milwaukee ARC will hold its annual swapfest on July 12 at American Legion Post 434, 9327 South Shepard Avenue, Oak Creek, Wisconsin, from about 7 a.m. to about 4 p.m. Amateur-radio exams will be conducted during the day by the Milwaukee Volunteer Core Group. Admission is $3. Talk-in on 146.94 MHz. For further information, including map, write the South Milwaukee ARC, PO Box 102, South Milwaukee WI 53172-0102.

POUGHKEEPSIE NY
JUL 12

The Mt. Beacon Hamfest will be on July 12, from 8 a.m. to 3 p.m. (sellers 7 a.m., auction 2 p.m.), at the Arlington Senior High School, Poughkeepsie/Lagrange, Dutchess County, New York. Big indoor flea market. Admission: $3 (hams and computer hobbyists); $4 with tailgating space; $6 with one free table. Talk-in on 146.37/.97 and 146.52 simplex. For further information, contact Julius Jones W2IHY, RR 2, Vanessa Lane, Staatsburg NY I2580; (914)-889-4933.

MAPLE RIDGE BC
JUL 12–13

The Maple Ridge ARC will sponsor the Maple Ridge Hamfest on July 12–13 at St. Patrick's Center, 22589 121st Avenue, Maple Ridge, British Columbia. Admission is $6, $3 for non-hams over 12, under 12 free, $9 for two hams in a family. Talk-in on 146.20/.80 and 146.34/.94. For more information, contact Bob Haughton VE7BZH, Box 292, Maple Ridge, British Columbia V2X 7G2, Canada; (604)-467-4915.

TEXAS 150TH
JUL 12–13

Special-event station W5SC will be operated from the Texas ARRL and VHF/FM Society convention to commemorate 150 years of Texas independence. Operation will be from 1200 UTC to 0400 UTC on July 12, and from 1200 UTC to 1800 UTC on July 13. Use the lower portions of the 10-, 15-, and 20-meter General CW and phone bands. Send a QSL and an SASE to W5SC, 90 Brees Boulevard, San Antonio TX 78209. For more information, call Andy Anderson WB5NOL at (512)-698-1712.

INDIANAPOLIS IN
JUL 12–13

The IARA will sponsor the 16th annual Indiana ARRL Convention and Indianapolis Hamfest on the weekend of July 12 and 13, at the Marion County Fairgrounds, Indianapolis, Indiana, opening at 6 a.m. each day. Gate admission is $5, with free parking, including overnight camper hookups and facilities. Inside tables are $8. ARRL and technical forums, home-brew display contest, QSL card contest (judging best personal and best-received cards), 2m fox hunt Saturday, 450m fox hunt Sunday. For further information, call Bill Evans WB9BEN at (317)-745-6389.

N. DAKOTA/MANITOBA
JUL 12–13

The 23rd International Hamfest and Computerfest will be held July 12 and 13 at the International Peace Garden between Dunseith, North Dakota, and Boissevain, Manitoba, Canada. Activities include transmitter hunts, mobile judging, and CW contests. Talk-in on .52 simplex. For further information, write MARA, Box 64, Minot ND 58702.

BSA CAMPOREE
JUL 12–20

Scout and Scouters from all over the world, with the assistance of the Southern Connecticut ARA and the Camp Sequassen Alumni Association, will operate a special-event station from the Boy Scouts of America Connecticut International Camporee. The station will be operated July 12–20 from 8 a.m. to 10 p.m. daily. Frequencies: phone—3.940, 7.290, 14.290, 21.360, and 28.990; CW—3.725 and 7.125. Send a QSL and an SASE to the Camp Sequassen Alumni Association, c/o Al Schwartz KA1CFA, 18 Russo Drive, Hamden CT 06518.

BOWLING GREEN OH
JUL 13

The Wood County (Ohio) ARC will sponsor the 22nd annual Ham-A-Rama on July 13 at the Wood County Fairgrounds, Bowling Green, Ohio. Admission is free. Talk-in on 147.18/.78 and 146.52. For more information, contact Chuck Dicken WD8ICP, 1002 Revere Drive, Bowling Green OH 43402; (419)-352-0865.

DOWNERS GROVE IL
JUL 13

The DuPage ARC is sponsoring a hamfest/computerfest on July 13, beginning at 8 a.m., at American Legion Post 80, 4000 Saratoga, Downers Grove, Illinois. Admission is $3 at the gate, $2 in advance. Indoor tables available. VEC exams for all classes. Talk-in on 146.52 simplex. For tickets or reserved tables, send an SASE to: Hamfest Chairman W9DUP, PO Box 71, Clarendon Hills IL 60514; or call (312)-985-0527 evenings and weekends.

WATERTON ALTA
JUL 18–20

The 52nd Glacier-Waterton International Hamfest will be held on July 18–20 at the Waterton Homestead Campground, just north of the Waterton National Park entrance on Highway 6, Alberta, Canada. For more information, write to PO Box 148, Milk River, Alberta T0K 1M0, Canada.

AUGUSTA NJ
JUL 19

The Sussex County ARC will sponsor SCARC '86 on July 19, beginning at 8 a.m., at the Sussex County Fairgrounds, Plains Road, off Route 206, Augusta, New Jersey. Admission is $3. Indoor tables are $7; tailgating space is $5. Talk-in on 147.90/.30 and 146.52. For more information, contact Donald R. Stickle K2OX, Weldon Road, RD#4, Lake Hopatcong NJ 07849; (201)-663-0677.

ATLANTA GA
JUL 19–20

The Atlanta Radio Club will sponsor the 1986 Atlanta HamFestival on July 19–20 at the Georgia World Congress Center, Atlanta, Georgia. Features include over 150 exhibitors and an air-conditioned flea market. For more information, send an SASE to the Atlanta HamFestival, Inc., PO Box 77171, Atlanta GA 30357.

YACHT RACE
JUL 19–20

The Eastern Michigan ARC will operate special-event station K8EPV on July 19–20, from 1400 UTC to 0200 UTC both days, during the annual Port Huron to Macinac Island yacht race. Frequencies: SSB—3.870, 7.235, 14.235; CW—3.710 and 7.110. For a multi-color QSL, send an SASE to C.B.A., 654 Georgia, Marysville MI 48040.

DES MOINES IA
JUL 19–20

The Des Moines RAA will hold the Iowa State Convention from 8 a.m. to 6 p.m. on July 19 and from 8 a.m. to 3 p.m. on July 20. Admission is $3 in advance, $4 at the door. Talk-in on 146.34/.94, 444.50, or 146.22/.82. For more information, write to DMRAA, PO Box 88, Des Moines IA 50301.

WHEELING WV
JUL 20

The Triple State RAC will hold its 8th annual Wheeling Hamfest/Computer Fair on July 20 at Wheeling Park, from 9 a.m. to 4 p.m., rain or shine. Admission is $3 in advance, $4 at door. Talk-in on 146.31/.91. To reserve space, contact Jay Paulovicks KD8GL, RD 3, Box 238, Wheeling WV 26003; (304)-232-6797. For tickets, contact TSRAC, Box 240 RD 1, Adena OH 43901; (614)-546-3930.

WASHINGTON MO
JUL 20

The Zero-Beaters ARC will hold its 24th annual hamfest on July 20, from 8 a.m. to 3 p.m., at Bernie H. Hillerman Park, Washington Fairgrounds, Washington, Missouri. Free flea-market space is available. License exams will be given. Talk-in on 147.84/.24 and .52. For more information, contact the Zero-Beaters ARC, Box 24, Dutzow MO 63342; (314)-239-2072.

FLAT HAMMOCK ISLAND
JUL 20

The Tri-City ARC will operate expedition station KA1BB on July 20, from 1300 to 2000 UTC, from Flat Hammock Island in Fisher Island Sound, New York. This will be only the third time that there has been HF operation from this island. Operation will be in the lower 20 kHz of the phone and CW portions of the 15-, 20-, and 40-meter General-class bands, as well as the center of the 40-meter Novice band. Send a QSL and an SASE to Tri-City ARC, PO Box 686, Groton CT 06340. For more information, contact Bob Dargel KA1BB, 8 Willow Lane, East Lyme CT 06333; (203)-739-8016.

SPACEFLIGHT 25TH
JUL 20–21

The Illinois Valley ARC will operate special-event station KD9UL from 1300 UTC July 20 to 0100 UTC on July 21 to commemorate the 25th anniversary of manned spaceflight—in conjunction with Spaceweek. Frequencies: phone—the bottom 25 kHz of the General phone bands; CW—the bottom 20 kHz of the Novice bands. For a QSL and a certificate, send your QSL and an SASE to Bruce Boston KD9UL, 815 East Third Street, Beardstown IL 62618.

RIVERCADE
JUL 23–27

The Sooland ARA will operate a special-event station on July 23–27, from 5 p.m. to 10 p.m. CDT daily, from the riverfront at the annual Port of Sioux City Rivercade. Operation will be on 14.285 MHz ±10 kHz. Operators will use their own calls but will add "Rivercade" to all CQs and contacts. To receive a certificate, send your contact number and a 9" SASE to Loren Barbee WB0YOW, 1015 16th Street, Sioux City IA 51105.

BIX BIEDERBECK JAZZ FESTIVAL
JUL 25–27

The Davenport Radio Amateur Club will operate special-event station W0BXR during the Bix Biederbeck Memorial Jazz Festival. Times of operation are: July 25, 1700–2200 UTC; July 26, 1500–2300 UTC; July 27, 1600–2200 UTC. Operation will be 80–10 meters, phone and CW, 10 kHz up from the lower end of the General-class bands. For a certificate, send a QSL and an SASE to the Davenport RAC, 2131 Myrtle Street, Davenport IA 52804.

RENTON WA
JUL 25–27

The Western Washington DX Club will host the 34th annual Pacific Northwest DX Convention on July 25, 26, and 27 at the Sheraton Hotel in Renton, Washington. Activities for the DXer and contester; a presentation from Bob Winters KD7P/KH4, recently returned from his Wake Island operation; and a tour of ICOM America, Inc., corporate HQ are included. Tickets purchased before July 1 for all activities are $38 ($42.50 at the door); for programs and banquet, $33; for programs only, $13. For further information, contact Andrew Isar NN7L, Convention Chairman, PO Box 224, Mercer Island WA 98040; (206)-467-1277.

STEAM AND GAS
JUL 26–27

The Pike County ARC will operate special-event station W9CHZ, from 1700 UTC on July 26 until 1700 UTC on July 27, from the 23rd reunion and show of the Antique Steam and Gas Engine Club. Operation will be in the low end of the 75-, 40-, and 15-meter General-class bands, phone and CW. There will also be operation in the 40-meter Novice band on July 26 from 2000–2330 UTC. For an 8 x 10 certificate, send a QSL and an SASE to PCARC, RR1 Box 311, Winslow IN 47598.

W. FRIENDSHIP MD
JUL 27

The Baltimore Radio Amateur Television Society (BRATS) will present the Maryland Hamfest and Computerfest on July 27 at the Howard County Fairgrounds, Rte. 144 at Rte. 32, adjacent to Interstate 70, in West Friendship, Maryland, beginning at 6 a.m. (dealer setups begin Saturday at 2 p.m.—overnight security provided). Tailgating space available for $4; advance reservations required for tables: indoor along the wall with ac outlets, $20 each or 4 for $75; without ac, $10 each or 10 for $95. Free VE exams at 11 a.m., no advance registration required. Talk-in on .63/.03, .16/.76, and .52. For reservations and further information, contact Mayer Zimmerman W3GXK, BRATS, PO Box 5915, Baltimore MD 21208; (301)-655-7812.

HAYS KS
JUL 27

The Hays ARC will hold a swapfest and auction on July 27, from 9 a.m. to 5 p.m., at the Sheridan Coliseum, Fort Hays State University, Hays, Kansas. Admission is $2, tables $1. Activities include VE testing, packet, OSCAR, ATV, video tapes, and fox hunting. Talk-in on 147.78/.18. For more information and reservations, contact Andy Oldham N0EBS, 117 N. 8th St., Wakeeney KS 67672; (913)-743-2712.

OHIO STATE FAIR
AUG 1–17

The Columbus ARA will be operating special-event station W8TO on August 1–17 to promote the Ohio State Fair. Operation will be on 80 through 10 meters. Times and frequencies to be determined by persons manning the booth at the fair (11 a.m. to 9 p.m. EDT daily). A valid exchange includes name, QTH, and RST. For a commemorative certificate, send a log extract or QSL card and an SASE to W8TO, Attn: State Fair Event Coordinator, 280 East Broad St., Columbus OH 43215.

PRO-FOOTBALL WEEKEND
AUG 2–3

The Canton ARC will operate special-event station W8AL to celebrate the Pro-Football Hall of Fame's Greatest Weekend on August 2–3, from 1700 to 2200 UTC each day. Operating frequencies will be: SSB—14.270 and 7.270; CW—14.060 and 7.060. For a special H.O.F. QSL card, send your card with an SASE to Randy Phelps KD8JN, 1226 Delverne Ave. SW, Canton OH 44710.

ANGOLA IN
AUG 3

The Steuben County RA will present their 28th annual FM Picnic and Hamfest at Crooked Lake, Angola, Indiana, on August 3. Two miles north of Angola, I-69 to Crooked Lake exit. Admission is $2.50. Inside tables for exhibitors and vendors available. Talk-in on 146.52 and 147.81/.21.

BERRYVILLE VA
AUG 3

The Shenandoah Valley ARC will sponsor its 36th annual Winchester Hamfest on August 3, from 7 a.m. to 3 p.m., at the Clarke County Ruritan Fairgrounds on Route 7, two miles west of Berryville, Virginia. Admission is $4, women and children under 12 are free. Tailgaters and limited tables $5. Talk-in on 146.22/.82 and 146.52 simplex. For further information, call Rob Kinsley NT4S at (703)-869-5113, or write SVARC at PO Box 139, Winchester VA 22601. Exams on August 2 at 9 a.m.—call Walt Quitter NC4B at (703)-869-5241, or send an SASE to 367 Buckingham Drive, Stephens City VA 22655.

WEST MIFFLIN PA
AUG 3

The South Hills Brass Pounders and Modulators ARC will hold its 49th annual hamfest on August 3 at the south campus of Allegheny Community College, located in West Mifflin, Pennsylvania, about seven miles south of Pittsburgh. Talk-in on 146.13/.73 and 146.52. For further information, contact Doug Wilson WA3ZNP, 185 Orchard Avenue, Emsworth PA 15202; (412)-761-1851.

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards or odd-sized scraps of paper. Please type or print your request (neatly!, double-spaced, on an 8-1/2 x 11 sheet of paper and use upper- and lowercase letters where appropriate). Also, please make a 1 look like a 1 not an l—which could be an el or an eye, and so on. Hard as it may be to believe, we are not familiar with every piece of equipment ever manufactured on Earth! Thanks for your cooperation.

I'm looking for the operating and service manual, including the schematic, for an Standart ACS 176 made by Weston Instruments, Inc., in Lexington MA. Will pay for any costs incurred.

J.F. Picard F6ERK
5 Place de L'Etoile
91330 Yerres France

Atari-XL hams! Some DLs, like me, are searching for any RTTY and HAM programs. For your help, I can offer you AMSAT-DL's OSCAR package, which is based on the Atari-XL microcomputer and provides packet radio communication via the projected DLSAT-OSCAR as well as via OSCAR-10.

Matthias Beier DD4WW/A
Keithstr 36 Ap 818
1000 Berlin 30
West Germany

I need the name of the magazine, including month and year, that ran an article on secure repeater control.

Peter Rowe VE3EQA
222 Westmount Drive S.
Orillia Ontario Canada L3V 6E4

I need a workable or repairable scope capable of a scan rate of 50mm/sec or less. A hospital EKG scope would do nicely.

Ira Linderman WB2RXR
PO Box 229
Commack NY 11725

I need documentation/info for a Pathcom/Pace Communicator II 2-meter FM rig (Pathcom has no information on file); a Measurements model 80 signal generator and any FMing mods and parts; Santec HT-1200 mods, commercial uses, etc.; and sim-patch circuits. Will compensate for copying and/or postage. Contact via phone or The Source (AAJ696), or mail direct.

Jim Aspinwall WB9GVF/5
3046 Creekband Circle
Grapevine TX 76051-6311
(817)-481-6311

I am looking for amateurs who purchased TET Antenna Systems of the HB9CV series. I have the model HB43SP, which works well on 10 and 20 meters but poorly on 15 meters. I have tried to make adjustments as stated in instruction, but these only resulted in a 50-kHz-wide vswr curve. Can any TET owner help? Also, is the TET being made now? If so, where, and by whom (address)?

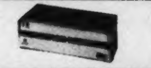
Dale McMindes KA4HBW/V2A
VOA Box 19
FPO Miami FL 34054

MULTI-BAND SLOPERS
ALSO: DIPOLES & LIMITED-SPACE ANTENNAS
Outstanding performance of W9INN antennas is well known! Now enjoy multi-band BIG-SIGNAL reports! Automatic bandswitching • Very low SWR • Coax feed • 3kw power • Compact • FULLY ASSEMBLED to your specified center frequency each band • Easy to install • Very low profile • Complete instructions • Your personal check accepted

4-BAND SLOPER - 160, 80, 40, 30, or 20M	60 ft. long	$ 48 ppd
3- " " - 160, 80, 40M	60 ft. "	$ 43 "
2- " " - 80, 40M	40 ft. "	$ 35 "
3- " NO-TRAP DIPOLE - 160, 80, 40M	113 ft. long	$ 71 "
2- " " " " - 80, 40M	85 ft. "	$ 55 "
9-BAND SPACE-SAVER DIPOLE - 160 thru 10M*	46 ft. long	$ 85 ppd

* Requires wide-range tuner (80, 40, 20, 15M without tuner)
SEND SASE for complete details of these and other unique antennas
W9INN ANTENNAS 312-394-3414
BOX 393-S MT. PROSPECT, IL 60056 ✓38

NEW 20-PAGE CATALOG FREE
7 MILLION TUBES
Includes all current, obsolete, antique, hard-to-find receiving, transmitting, industrial, radio/TV types. LOWEST PRICES. Major brands in stock.
Unity Electronics Dept. S ✓78
P.O. Box 213, Elizabeth, N.J. 07206



TRS-80* RTTY
- ROM-116
- RTTY-CW
- TRS-80 MOD III/IV

*Trademark of Tandy Corp.
THE MARTIN CO. (206)653-9596
P.O. BOX 982 MARYSVILLE, WA 98270

QSL
LASER PRINTED
QSLs
Top Quality - Low prices
Write for Information
THE LASER PRESS
P.O. BOX 876
MOUNDSVILLE WV 26041

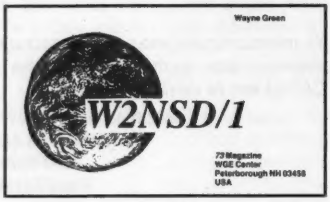
TUBES — OVER 2000 TYPES!
DISCOUNT PRICES
Parts, supplies, and literature for tube type radios, inlcuding early and hard-to-find tubes.
✓74 "New 20 page wholesale catalog available."
ANTIQUE ELECTRONIC SUPPLY
688 W. First St. • Tempe, Arizona 85281 • (602) 894-9503

CB-TO-10 METERS
We specialize in CB radio modification plans and hardware. Frequency and FM conversions, books, kits, repairs, high-performance accessories. Our 11th year! 16-page catalog, $2.
CBC INTERNATIONAL, P.O. BOX 31500X
PHOENIX, AZ 85046

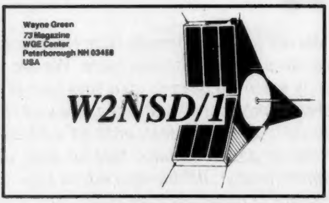
PACKET
CONNECT-ALARM
for the TNC-2 and clones
Are you out of the room when another station is trying to connect to you? A LOUD BEEP FROM THE CONNECT-ALARM LETS YOU KNOW WHEN SOMEONE IS TRYING TO REACH YOU Works with the TAPR TNC-2 PAC-COM TNC-2. and A E A PK-80 The beep time is screwdriver adjustable from a fraction of a second all the way to a long 9 seconds Fits entirely inside the TNC-2 chassis Easy four wire hookup to TNC-2 board Furnished with top quality I C . cermet sealed trimpot piezo buzzer and a 1 5 inch square glass-epoxy board
Complete Kit $16 89 • Assembled Unit $22 64
Shipping add $2 00
SEND S A S E FOR MORE INFORMATION
WATT engineering ✓98
(805) 564-3682-to order
(805) 964-0099-tech info
Visa/Mastercard Accepted
Money back guarantee
P.O. Box 1848 Goleta, CA 93116

TEST EQUIPMENT
RE-CONDITIONED AND LAB CALIBRATED
HP 606A SIGNAL GENERATOR, 50 KHZ TO 65 MHZ, RF OUTPUT 0.1 MV TO 3V IN 50 OHMS, CRYSTAL CALIBRATOR, 400/1000 HZ MODULATION $375.00
HP 608C SIGNAL GENERATOR, 10 MHZ TO 480 MHZ, 0 TO 0.1 MV TO 1V RF OUTPUT INTO 50 OHMS, AM/CW PULSE, OR 400/1000 HZ MODULATION CALIBRATED ATTENUATOR $345.00
HP 608D SIGNAL GENERATOR, 10 MHZ TO 420 MHZ AM, CW OR PULSE OUTPUT, 400/1000 HZ MODULATION OMV TO 5V INTO 50 OHMS, CALIBRATED ATTENUATOR $295.00
TS-510A/U SIGNAL GENERATOR, 10 MHZ TO 420 MHZ MIL/SPEC MILITARY VERSION, SAME AS HP608D $295.00
HP614A SIGNAL GENERATOR, 900 MHZ TO 2100 MHZ, INTERNAL OR EXTERNAL PULSE OR FM MODULATION, 0.5 MV TO 1V INTO 50 OHMS, CALIBRATED OUTPUT $345.00
HP 616A SIGNAL GENERATOR, 1.8 GHZ TO 4.2 GHZ 0.1 MV TO 1V INTO 50 OHMS, CALIBRATED OUTPUT INTERNAL, EXTERNAL PULSE, FM MODULATION $375.00
HP-618B SIGNAL GENERATOR 3.8 GHZ TO 7.6 GHZ, 0.1 MV TO 1V INTO 50 OHMS, CALIBRATED OUTPUT, INTERNAL, EXTERNAL PULSE OR FM MODULATION $375.00
SG-557/URM-52 SIGNAL GENERATOR 3.8 GHZ TO 7.6 GHZ, MIL/SPEC MILITARY VERSION, SAME AS HP618B $325.00
HP620A SIGNAL GENERATOR, 7 GHZ TO 11 GHZ, CALIBRATED OUTPUT INTERNAL, EXTERNAL, PULSE, FM MODULATION $450.00
HP 626A SIGNAL GENERATOR, 10 GHZ TO 15 GHZ INTERNAL, EXTERNAL, PULSE, SQUARE WAVE, FM MODULATION CALIBRATED OUTPUT, 10 MW TO 1 PW $650.00
HP 628A SIGNAL GENERATOR, 15 GHZ TO 21 GHZ, CALIBRATED OUTPUT 10 MW TO 1 PW INTERNAL, EXTERNAL, SQUAREWAVE, PULSE, FM MODULATION $650.00
URM-25 MILITARY SIGNAL GENERATOR, 10 KHZ TO 50 MHZ, RF OUTPUT 0 MV TO 2 VOLTS AM/CW 400/1000 HZ MODULATION, 50 OHM STOP ATTENUATOR, SMALL PORTABLE UNIT $245.00
URM-26 MILITARY SIGNAL GENERATOR, 4 MHZ TO 405 MHZ, CALIBRATED OUTPUT ATTENUATOR 0 MV TO 2 VOLTS, AM/CW 400/1000 HZ MODULATION, SMALL PORTABLE UNIT $245.00
MARCONI TF 1066B SIGNAL GENERATOR 10 MHZ TO 470 MHZ, AM/FM, CALIBRATED OUTPUT, INTERNAL FM OF 1 AND 5 KHZ WITH 100 KHZ VARIABLE DEVIATION, AM MODULATION OF 1 AND 5 KHZ, CALIBRATED RF OUTPUT 0 TO 200 MV $550.00
HP 5245L FREQUENCY COUNTER, MEASURES FREQUENCY, PERIOD, RATIO AND MULTIPLE RATIO MULTIPLE PERIOD AVERAGE, FREQ. RANGE 0 TO 50 MHZ WITH HP5253B PLUG-IN SUPPLIED, EXTENDS RANGE TO 500 MHZ, SOLID STATE COUNTER $375.00
WE ACCEPT VISA, M/C OR CHECK. ADD SHIPPING. WE SHIP BEST WAY WORLDWIDE. SATISFACTION GUARANTEED, IMMEDIATE SHIPMENT. WRITE OR PHONE TODAY. BILL SLEP 704-524-7519—OUR 30TH YEAR!
SLEP ELECTRONICS CO.
U.S. HIGHWAY 441
OTTO, NORTH CAROLINA 28763

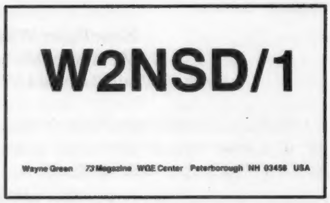
THEY'RE BACK


Wayne Green
W2NSD/1
73 Magazine
WGE Center
Peterborough NH 03458
USA

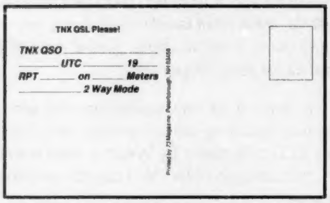
Style W


Wayne Green
73 Magazine
WGE Center
Peterborough NH 03458
USA
W2NSD/1

Style X


W2NSD/1
Wayne Green 73 Magazine WGE Center Peterborough NH 03458 USA

Style Y


TNX QSL Please!
TNX QSO
UTC
19
RPT
on
Meters
2 Way Mode
Printed by 73 Magazine Peterborough NH 03458

Reverse

The quality QSLs you've been looking for are here—at an incredibly low price! These cards are printed in two colors (blue globe or satellite, black type) on heavy, glossy stock. Now you can afford to QSL 100%!

• Order now before we regain our sense •

I'll do it! Send me the cards and quantities indicated below.

Style: ☐W ☐X ☐Y

Quantity: ☐100 — $8.97
☐250 — $19.97
☐500 — $39.97

Please add $1 S&H

Please print your name and address exactly as it will appear on your cards:

Name________ Call________

Address________

City________ State________ Zip________

☐ Check ☐Amex ☐ MC ☐ VISA

#________ Expires________

Please allow 4 to 6 weeks for delivery.

767600

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we've decided to go directly to the source—you, the reader. Below, the articles and columns in this issue are assigned numbers. These numbers correspond to those on the "Feedback" card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

"What's in it for me?" comes the cry from our faithful readers. Besides the knowledge that you're helping us find out what you like (and don't like), we'll draw one Feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save some money on stamps, why not fill out the Reader Service card, the Product Report card, and the Feedback card and put them in an envelope. Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 22 cents!

Feedback #	Title
1	Dayton '86
2	How To Build A Great Ham Club
3	Roll A RTTY Scope
4	Bozo And the B-Hunt
5	HAMS Against Drunk Driving
6	The Piggy-Bank Patch
7	Future Hams of America
8	Publish Or Perish
9	Genius Brings Home the Bacon
10	Administering the Novice Exam
11	Troubleshooting With the DMM
12	Kit Corner: The DSE RDF
13	C-64 S-s-s-tutter Fix
14	Review: The Kenwood TH-31AT
15	Review: The Heathkit HD-3030
16	Above and Beyond
17	Barter 'N' Buy
18	Contests
19	Fun!
20	Ham Awards
21	Ham Help
22	Letters
23	Looking West
24	Never Say Die
25	New Products
26	NK6K>Packet
27	Propagation
28	QRP
29	QRX
30	RTTY Loop
31	Satellites
32	*73* International

Congratulations to **Bruce Palmer N1CNM,** this month's winner of a one-year subscription.

☐**Yes!** I want to subscribe! Send me 1 year (12 issues) of *73* at the low rate of $19.97. (Base rate: $24.97)

Name Call

Address

City State Zip

☐AE ☐MC ☐VISA ☐Check Enclosed

Card#__________ Exp. Date ______

July 1986—card valid until August 1986. You make the *73* supporting advertisers very happy when you're interested in them . . . Wayne

FREE INFORMATION

READER SERVICE CARD

1	2	3	4	5	6	7	8	9	10	151	152	153	154	155	156	157	158	159	160
11	12	13	14	15	16	17	18	19	20	161	162	163	164	165	166	167	168	169	170
21	22	23	24	25	26	27	28	29	30	171	172	173	174	175	176	177	178	179	180
31	32	33	34	35	36	37	38	39	40	181	182	183	184	185	186	187	188	189	190
41	42	43	44	45	46	47	48	49	50	191	192	193	194	195	196	197	198	199	200
51	52	53	54	55	56	57	58	59	60	201	202	203	204	205	206	207	208	209	210
61	62	63	64	65	66	67	68	69	70	211	212	213	214	215	216	217	218	219	220
71	72	73	74	75	76	77	78	79	80	221	222	223	224	225	226	227	228	229	230
81	82	83	84	85	86	87	88	89	90	231	232	233	234	235	236	237	238	239	240
91	92	93	94	95	96	97	98	99	100	241	242	243	244	245	246	247	248	249	250
101	102	103	104	105	106	107	108	109	110	251	252	253	254	255	256	257	258	259	260
111	112	113	114	115	116	117	118	119	120	261	262	263	264	265	266	267	268	269	270
121	122	123	124	125	126	127	128	129	130	271	272	273	274	275	276	277	278	279	280
131	132	133	134	135	136	137	138	139	140	281	282	283	284	285	286	287	288	289	290
141	142	143	144	145	146	147	148	149	150	291	292	293	294	295	296	297	298	299	300

Reader Service: To receive more information on the products advertised in this issue of *73*, circle the appropriate number. If you're really in a hurry to buy, mark the number with X, and we'll get a move on.

3676R

73 Magazine Product Report Card

Please rate any ham gear you're using from (0) poor to (9) superb.

Manufacturer	Model	Your Rating	When Purchased	Notes
1.				
2.				
3.				
4.				
5.				

Comments:____________________

Your name, call, complete address:____________________

☐Please enter my subscription to **73 Magazine** for one year at $19.97. (Base rate: $24.97) 3676C

☐AE ☐MC ☐VISA ☐Check Enclosed. Card#__________ Exp. Date ______

FEEDBACK

The Pitch: *73* wants to know what you want to read. Help us by voting on this month's features and columns—you'll find their numbers in the Feedback box on the page preceding this card.

The Payoff: Each month we'll draw a card at random. If yours is picked, you'll receive a one-year subscription (or extension) to *73*.

Article #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Great																									
OK																									
No Way																									

Article #	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Great																									
OK																									
No Way																									

Name ____________________

Address ____________________

City__________ State ____ Zip______

I'd like to see more ____________________

I'd like to see less ____________________

3676F

Place
Stamp
Here

73 Amateur Radio

Reader Service
WGE CENTER
70 RTE. 202 NORTH
PETERBOROUGH, NH 03458-9995

Place
Stamp
Here

73 Amateur Radio

Reader Service
WGE CENTER
70 RTE. 202 NORTH
PETERBOROUGH, NH 03458-9995

Place
Stamp
Here

73 Amateur Radio

Editorial Office
WGE CENTER
70 RTE. 202 NORTH
PETERBOROUGH, NH 03458-9995

ADVERTISERS

R.S.#		page
65	AEA	111
155	Ace Communications, Inc.	21
1	Advanced Computer Controls	11
2	All Electronics	103
158	Aluma Towers	20
3	Amateur Comm., Etc.	106
*	Amateur Electronic Supply	55
64	Anteck, Inc.	86
74	Antique Electronic Supply	79
16	Astron Corp.	51
*	The Atlanta Hamfestival	27
159	Automated Production Equipment Corp.	20
53	Barker & Williamson	62
41	Barry Electronics	47
42	Bilal Company	91
8	Bill Ashby & Son	86
160	Bird Electronic Corporation	21
90	Britt's 2-Way Radio	106
92	Burghardt Amateur Radio	71
*	CBC International	79
68	CES, Inc.	101
46	Charge-Rite	91
45	Coaxial Dynamics	67
165	Coaxial Dynamics	21
59	Communications Electronics	25
10	Communications Specialists	13
85	Comprad	86
99	Computer Supplies of Peterborough	31
11	*Computer Trader*	43
12	Connect Systems, Inc.	2
*	Cost Effective Components	75
162	Davie Tech, Inc.	21
*	Dick Smith Electronics	69
*	Engineering Consulting	35
76	Etron RF Enterprises	106
75	Fair Radio Sales	86
58	Fox-Tango	106
17	GLB Electronics	110
72	Glen Martin Engineering	106
71	Grove Enterprises	71
20	Ham Radio Outlet	1
*	The Ham Station	50
*	Hamtronics	21, 63
94	Harrison Radio	9
*	ICOM America, Inc.	Cov. II
*	Indianapolis Hamfest	85
97	International Radio	43
56	Kantronics	109
*	Kenwood	5, 6, Cov. IV
23	Larsen Electronics	81
151	Larsen Electronics	20
*	The Laser Press	79
156	Lynx, Inc.	20
24	MFJ Enterprises	104
89	MFJ Enterprises	105
25	Madison Electronic Supply	29
47	Maggiore Electronic Lab	57
*	The Martin Company	79
26	Micro Control Specialties	109
70	Micrology Corp.	54
91	Mirage/KLM	14
80	Missouri Radio Center	112
84	Multibotics	69
152	Multibotics	20
95	Naval Electronics	71
50	Nemal Electronics	75
167	Orion Hi-Tech	20
96	Orlando Hamcation and Computer Show	86
28	P.C. Electronics	19
29	The PX Shack	85
44	Pac-Comm Packet Radio Systems, Inc.	85
30	QEP's	85
161	R.A. Kent	21
31	Radio Amateur *Callbook*, Inc.	39
32	Radio Engineers	85
34	Ramsey Electronics	73
166	Resultant Engineering	21
	73	
	Canadian Subscriptions	75
	QSLs	80
	Subscriptions	33
	Sweepstakes	97
	Toll-Free #	69
157	Selectone Corp.	21
154	Sencore, Inc.	20
73	SF-Amateur	86
153	Sibex	21
*	Slep Electronics	79
35	*Spec-Com Journal*	67
51	Spectrum Communications	15
78	Unity Electronics	79
*	University Microfilm	86
79	Vanguard Labs	106
38	W9INN Antennas	79
98	Watt Engineering	79
39	Western Electronics	85
69	Westcom RF Parts	67
163	Wm. M. Nye Company	21
93	World Tech Products	43
40	Yaesu Electronics	Cov. III

* Please correspond with this company directly.

CUT YOUR LOSSES

Portable radios can be a trade-off. In return for mobility you get loss of performance.

Well now you can cut your losses significantly. All you need is the new Larsen UHF KūLDUCKIE® KD14-HW half-wave antenna.* It's a mouthful but it'll do your ears a lot of good.

Because it's half-wave, the KD14-HW is fully resonant despite the poor ground plane portables are faced with. Under ideal ground plane conditions, it delivers performance equal to a full quarter-wave. And that's a powerful improvement over most portable antennas!

And because it is inherently resonant, the KD14-HW can also be easily remoted with a length of coax.

The KD14's flexible, easy-to-get-along-with radiating element measures a scant 12 inches. At the base is a 3¼ inch impedance transformer that gives added strength.

The KD14 half-wave series is also available in a collapsable 2-meter version.

Cut your losses and improve your gain when you operate with the new Larsen UHF KūLDUCKIE® KD14-HW, with no-nonsense warranty. You can see it at your favorite amateur dealer.

*For units with BNC output.

~23

Larsen Antennas
The Amateur's Professional™

See your favorite amateur dealer or write for a free amateur catalog.

IN USA: Larsen Electronics, Inc./11611 N.E. 50th Ave./P.O. Box 1799/Vancouver, WA 98668/206-573-2722
IN CANADA: Canadian Larsen Electronics, Ltd./149 West 6th Ave./Vancouver, B.C. V5Y 1K3/604-872-8517

LARSEN® KūLROD® AND KūLDUCKIE® ARE REGISTERED TRADEMARKS OF LARSEN ELECTRONICS, INC.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

A few months ago, I wrote about the trials and tribulations of a reader who wanted to put a TRS-80 Model 100 computer onto RTTY. At the time, I said that I had no helpful information available. Well, thanks to some others in the fraternity (non-sexist, of course), we have an answer.

Phil W6TUH passed along his thoughts on Model 100 RTTY through CompuServe. He said that he is using his Model 100 with an HF rig (Kenwood TS-520S) via a Kantronics UTU (Universal Terminal Unit). It is easy to set up and works well. The cost is about $200 and *no* software is needed; all software to support RTTY, CW, AMTOR, and ASCII is ROM-resident in the UTU. The unit connects to the Model 100 RS-232 port (STAT=38I1E,10) and to the rig from the external speaker and mike connectors (AFSK)—and can support FSK, as well.

Although he's been at it for 31 years, Phil says that he's not a gung ho ham. But, even though the UTU may not give the ultimate RTTY station, it will work with any computer that can support a dumb-terminal mode and has RS-232 with the required (fairly standard) communications parameters. Phil hasn't used it on VHF, but it appears that connection to a 2-meter rig would be simple.

Phil adds an important caveat: Unless your rig has a special RTTY mode, reduce the dc input to 30–50% of CW value, since duty cycle is 100% on RTTY; otherwise, kiss your finals goodbye!

David Wolovitz WA3DNM of Media, Pennsylvania, sent me some E-mail on CompuServe informing me of a piece of software called RTTY.100 that's available on the Model 100 SIG. Written by Steve Alverson WB8HRV, this is a "mostly BASIC" program that enables the Model 100 to be used as a RTTY terminal.

Steve writes that the program is designed to allow the Model 100 to transmit and receive Baudot (Murray) 5-level RTTY code. Speeds of 60, 66, 75, and 100 wpm are supported. Both received and transmitted text can be echoed to a printer, and the RTS control line can be used for transmitter control.

```
1 GOTO 100
2 REM RTTY terminal emulator - 09/24/85 Steve Alverson WB8HRV
  75236,341
5 P=0:OUT186,INP(186)AND127:PRINT:PRINT"Receiving":IFPTHENLPRINT
10 IFTTHEN60ELSECALLVARPTR(ML(0)),0,VARPTR(X(0)):IFX(0)=0THENGOTO10
   ELSEIFX(1)>31THENGOTO10
20 IFX(1)=0THENGOTO10
25 IFX(1)=27THENF=-1:GOTO10
30 IFX(1)=31THENF=0:GOTO10
35 IFX(1)=4THENF=0
40 IFFTHENR$=MID$(F$,X(1)+1,1)ELSER$=MID$(L$,X(1)+1,1)
45 CALL19268,ASC(R$):IFPTHENCALL27967,ASC(R$)
50 GOTO10
60 F=0:OUT186,INP(186)OR128:PRINT:PRINT"Transmitting":IFPTHENLPRINT
70 IFNOT(T)THEN5
72 S$=INKEY$:IFS$=""THEN70ELSECALLVARPTR(ML(9)),ASC(S$),VARPTR(S)
80 S=INSTR(2,L$,CHR$(S)):IFS=0THEN90ELSES=S-1
85 IFFTHENCALL28210,31:F=0
87 CALL28210,S:PRINTS$;:GOTO70
90 S=INSTR(2,F$,S$):IFS=0THENBEEP:GOTO70ELSES=S-1
95 IFNOT(F)THENCALL28210,27:F=-1
97 CALL28210,S:PRINTS$;:GOTO70
100 DEFINT A-Z:DIM L$(31),F$(31),ML%(11),X(1)
110 L$=" E"+CHR$(10)+"A SIU"+CHR$(13)+"DRJNFCKTZLWHYPQOBG MXV"
120 F$=" 3"+CHR$(10)+"_ "+CHR$(7)+"87"+CHR$(13)+"$4',!:(5"+CHR$(34)+
    ")2#601978 ./;"
130 A=0:F=0:T=0:S=0:FORI=0TO11:READML(I):NEXTI
140 CALL 16969
150 OPEN "COM:28N1D" FOR INPUT AS 1
160 OUT186,37:OUT216,5:OUT188,52:OUT189,77:OUT184,195
165 POKE65421,31
170 ON KEY GOSUB 200,210,220,230,260,240,250,300
175 KEY ON
180 GOTO 5
200 OUT188,52:OUT189,77:OUT184,195:RETURN
210 OUT188,0:OUT189,76:OUT184,195:RETURN
220 OUT188,139:OUT189,74:OUT184,195:RETURN
230 OUT188,22:OUT189,72:OUT184,195:RETURN
240 F=0:PRINT:IFPTHENLPRINT
245 RETURN
250 IFPTHENP=0ELSEIF(INP(187)AND6)<>2THENPRINT"LST not ready!":ELSEP=1
255 IFPTHENPRINT"Echo on":RETURN:ELSEPRINT"Echo off":RETURN
260 T=NOT(T):RETURN
300 MENU
400 DATA 54,28109,-14227,9012,35,32461,30573,13859,-14080,-13056,4073,
    -13961
```

Program listing 1. RTTY.100.

This program uses the RS-232 port. It requires an external TU (terminal unit) to first convert the receiver audio into RS-232 levels, and then convert it back into tones for transmission. Steve uses a Flesher Corp. TU-300, but any TU with RS-232-compatible signal levels should work. Note that the TU-300 does *not* support RS-232 transmit control—external circuitry is required.

Program Operation

The program begins in receive mode at 60 wpm with echo to printer disabled. Function keys F1 through F4 set the speed to 60, 66, 75, and 100 wpm, respectively. F5 toggles in and out of transmit, F6 sets letters mode and starts a new line, F7 toggles the echo to printer mode, and F8 returns to Menu.

The buffer stores about 30 characters in receive mode, and will transmit them as soon as you select transmit. If you type any character that does not exist in Baudot, you get beeped and nothing is sent. Letters may be typed in upper- or lowercase: They are converted to uppercase before transmission, but are echoed in lowercase (also to the printer, if enabled). This could be useful to differentiate received from transmitted text on a printout.

Steve adds that if he understood more about the LABEL line, he would allow the LABEL key to toggle the last line with a description of the function keys. Any takers??

Machine-Language Calls

Several machine-language calls are used in this program. For those who are interested but who do not have access to references, they are listed below:

16969 (4249H)—Turns on the cursor

19268 (4B44H)—Prints the character in the A reg onto the LCD

27967 (6D3FH)—Prints the character in the A reg onto the LST

28210 (6E32H)—Sends the character in the A reg to the RS-232 port

In addition, a machine-language routine is read into array ML. The entry point at ML(0) checks for received characters. If none are present, it returns with X(0) = 0. If a character has been received, X(0) = 1 and the character is in X(1). The entry at ML(9) converts the character in the A register to uppercase, and places it in the variable pointed to by HL. This allows transmitted text to be typed in lowercase and automatically converted to uppercase (Baudot has no lowercase).

The program itself, RTTY.100, can be downloaded from the Model 100 SIG on CompuServe or, for brave souls with sturdy typing fingers, can be typed in from Program listing 1. Good luck, all, and let me know how it goes. My thanks, again, to Phil, David, and Steve, for all the help and information.

Turning to some paper mail, I have a letter here from Edward Kotz NG0R of Roggen, Colorado. He tells me that he has a second-hand, kit-built HAL ST-5 demodulator and would like to interface it to an RS-232 port for his IBM-compatible NCR PC-6 computer. He wrote to HAL but they said, "The ST-5 was not meant to be used with a computer. . . best solution. . . PCI-2000." No kidding! It seems to him that the price tag is about $600 or more. He wonders if the modification could not be done using optoisolators, relays, or the like.

Well, Edward, I sympathize with you in the amount of information received in response to your request. I have been less than successful in obtaining information from most manufacturers I contact. In the case of the ST-5, I think I have good news for you.

An "FSK" output is available at pin 3 of jack J2 of the constructed ST-5. According to specs, output from this terminal is −15 V on mark and +15 V on space. Sound familiar? You got it, that meets RS-232 specs nicely. Now, in order to get this output, all you should have to do is complete the loop, with a resistor if needed. And that's it!

Now, if you have an ST-5 built from boards, without the "standard" output plugs, you will find the "FSK" output on the power-supply board at a hole between the bodies of R106 (a 8.2k, 1-Watt resistor) and D105 (a 1N4005 diode). Don't forget to close the loop, even if you don't use a conventional RTTY machine. I look forward to hearing how well you do.

Another regular reader, Peter NH6BF/KA6BF/7J6CAG (whew!), says he got onto RTTY with a Heathkit 151, another IBM-compatible computer. He is using KF4NB's software and is having a blast with it. He relates that the major differences between his old CoCo and the Heath setup are disk access, enhanced memory for traffic, 80-column display, and more bells and whistles throughout. The only problem he says he has is more noise generated by the Heath than the CoCo (ha!).

For further information to the gang, Peter passes along his review of some of the hardware he has used. He feels that the MFJ-1224 interface copies better than an old Kantronics "The Interface," but doesn't stand its ground next to an AEA CP-1 or TONO. The MFJ, he says, requires an S-9 signal for perfect copy, which he needs for volume traffic handling, whereas the AEA copies an S-2. I, for one, would be interested in others' observations and comparisons of these units.

Peter also notes that he has seen a disk-based program for the CoCo that had all kinds of features, like buffers from a disk file, selcal, saving the received information to disk, and disk file transmit. He thinks it was called RTTY64, but he cannot put his hands on the program. Does anyone out there know about this program and where it has been hiding? Tell me, tell me, folks. Let's not keep a good thing secret!

Sometimes I get letters that I just don't know how to answer. Joseph Lerch, Jr. KC3GV writes that he recently purchased an Apple IIc system, and wants to get it onto RTTY. He notes that the IIc does not have a game paddle I/O port, which makes interfacing it more difficult than other Apple IIs. Apparently he has had little luck finding out anything from those around him whom he has contacted. Any of y'all have any suggestions? Pass them along, and I'll forward what I can.

The toughest question he asks, though, is the last one in the letter. He says, "Would you say I made the best choice, or is there a better setup? I can't afford a Commodore, too, and we needed the Apple." I don't know that there is a "best" setup, Joseph. The bottom line has always been what you are using the computer for. If only for RTTY, an inexpensive C-64 or CoCo may well be all that you need. But, if you need an Apple to use other programs, then by all means, buy the Apple. Ditto if you need a PC compatible. You see, there is no easy answer and, when all is said and done, you may not even be happy with one computer for all purposes. The statement may be trite, but "you pays your money and takes your choice!"

On and off, for the last year or so, I have been asking you all what you thought about packet-radio coverage in this column. Reaction has been kind of mixed, so I am pleased to welcome fellow columnist Harold Price NK6K to the pages of *73*, where he has begun writing a column specifically devoted to packet. I know that this is an exciting vanguard area in amateur radio, and I hope that those of you who are experimenting with packet will keep both Harold and me posted on your efforts.

As for me, I continue to hang around here and there, and may even have a new skyhook up by the time this reaches print. If only I can get the bow and arrow working! Of course, I welcome your questions by mail, as well as by E-mail, via my CompuServe ppn 75036,2501. More than a few of you have expressed interest in a feeler I put out regarding a RTTY program for the CoCo. I will continue to play with the idea, and publish what I can right here in RTTY Loop.■

QRP

William R. Stocking W0VM
1030 Weidman Road
Manchester MO 63011

YOU CAN TAKE IT WITH YOU

When vacation time comes around, the OM would like to stay home, operate his radio station, and experiment with antennas. He has had his nose to the grindstone all year and has had little or no time for his favorite hobby. However, his wife is tired of being at home all of the time and would like to have a vacation in the beautiful mountains of Colorado. The kids would also like to go away for a week or two. This family problem *can* have a happy solution! The OM can take a small radio station with him.

Instead of going to the Broadmoor Hotel in Colorado Springs, the family can (for much less money) rent a comfortable cabin north of Estes Park. With the money thus saved, equipment for a good QRP battery-operated station can be purchased. This is one way of getting money for buying equipment. There is the old saying: Where there is a will, there is a way! If family finances are tight, perhaps a friend will lend the OM a small transceiver for use on the vacation.

What will the OM need for his portable station? In addition to the small transceiver, he will need a power supply and an antenna system. A Ten-Tec Argosy or Argonaut transceiver would be an excellent choice. The Argosy has a switch that shows forward rf power in one position and reflected rf power in its other position. This switch eliminates the need for an swr meter when you use an antenna tuner.

Heathkit QRP transceivers also could be used. The HW-7, 8, and 9 are all usable. The HW-9 is the best of the three because it has a superheterodyne receiver and a bit more power output.

For the power supply, a 12-volt motorcycle battery and an inexpensive battery charger will do the job nicely.

A new Ten-Tec Argosy transceiver without a power supply costs from $600 to $700, depending on how many CW filters or other "extras" are ordered. Used transceivers can be obtained for somewhat less. The Heathkit HW-9, in kit form, sells for around $250 (plus whatever extras are desired). For the power supply, a 12-volt motorcycle battery costs from $25 to $30 and can be kept charged using a small $10 battery charger.

There are several kinds of antenna systems that can be used. A lightweight, easy-to-put-up pole that will knock down into four- or five-foot lengths should be obtained. A telescoping 20-foot fiberglass fishing pole would be ideal for the top part of the pole. Such a pole should be capable of holding up the center of a wire antenna. Although more poles could be used, a single pole will do nicely to hold up the center of an inverted-vee antenna system. Naturally, the taller the pole, the better. Using a pole made of fiberglass or other insulating material is desirable so that a vertical antenna for 20 meters or a higher frequency band could be taped to the pole.

Endfed antennas do not have heavy feedlines and can be made out of lightweight wire. Endfed wire antennas also will work on two or more bands. Of course, an antenna tuner must be used with any endfed antenna. However, if the antenna is a resonant length for the band or bands to be used, a small tuner consisting of a parallel tuned coil can be constructed easily from parts found in a junk box. For a list of resonant length wires, see Table 1. For quarter-wavelength wires for a grounding system, see Table 2.

When you're using an endfed antenna, it is desirable (if not absolutely necessary) to have a quarter-wavelength wire for each band to be used connected to the ground post of the antenna tuner. These wires are sometimes called radials and they can take the place of a ground when it is difficult to get a good ground. These

80 meters—66 feet
40 meters—33 feet
30 meters—23 feet
20 meters—16-1/2 feet
15 meters—11 feet
10 meters—8-1/2 feet

Table 1. Resonant lengths of wire.

135 feet is resonant on the 80-, 40-, 20-, 15-, and 10-meter bands
67 feet is resonant on the 40-, 20-, 15-, and 10-meter bands
46 ft., 2 in. is resonant on the 30-meter band
33 feet is resonant on the 20- and 10-meter bands
22 feet is resonant on the 15-meter band
18 feet is resonant on the 10-meter band (low frequency end)

Table 2. Lengths of quarter-wavelength ground "radial" wires.

RESONANT LENGTHS

A 135-foot wire is resonant on harmonically related bands as follows:

On 80 meters (3.5 MHz) it is a half-wavelength dipole
On 40 meters (7 MHz) it is a one-wavelength dipole
On 20 meters (14 MHz) it is a two-wavelength dipole
On 15 meters (21 MHZ) it is a three-wavelength dipole
On 10 meters (28 MHz) it is a four-wavelength dipole

If you add 5 feet more to one end of the 135-foot wire, it will become a 3/2-wavelength resonant wire for the 30-meter (10.1-MHz) band.

Of course, if the antenna tuner is one which will load up random lengths of wire, the length of the antenna wire can be any "reasonable" length that is at least a quarter-wavelength long for the lowest band to be used. Wires 1/2 to 3/4 wavelengths long at the frequency being used radiate at right angles to the antenna. Wires one wavelength or longer at the frequency being used radiate in a four-leafed-clover directional pattern. However, an inverted-vee configuration will send fairly well in all directions.

wires can be cabled together and run along the baseboard inside the cabin, or go out through the door under the bottom hinge. For an out-of-doors station, the wires can be laid on the ground.

There probably is no need to have a 15-meter radial wire since the 40-meter wire is 3/4 of a wavelength for 15 meters—an odd number of quarter wavelengths. For an excellent discussion of ground radials, see *Simple Low-Cost Wire Antennas for Radio Amateurs* by William I. Orr W6SAI and Stuart D. Cowan W2LX (Chapter 8, "The End Fed, Multi-Band Antenna," pp. 95–98).

It is a good idea to use well-insulated wire for vacation antennas rather than wire that has only enamel for insulation. Well-insulated wire can go out of a building under a window or through a door near a hinge.

Photo A. Pole supporting the fishing rod is lashed to the porch railing.

In a typical cabin, a small table can be placed near a door or window. It can hold the transceiver, the swr meter (if any), the antenna tuner, the telegraph key (or paddle and keyer), the log book, paper, and pen or pencil. The wire from the antenna tuner could go through the door above the top hinge or out under a window, up to the top of the antenna pole, and out and down to a rope tied to a tree, stake, or other suitable object.

On warm days, the family can go on picnics in high-altitude parks. A QRP amateur radio station could be set up on a picnic table. In a location where there is a clear view to the east and northeast, East Coast stations can be worked easily with 5 Watts rf output. It is probable that under good conditions European stations could be worked. Such a station on a picnic table can be used to try out different kinds of antennas. The OM might want to try endfed resonant-length wires for different bands. He might want to try a 135-foot-long wire and find out how well it works on several harmonically related bands (80, 40, 20, 15, and 10 meters—see box).

An interesting antenna to try would be a 33-foot endfed vertical for use on the 20-meter band. Assuming that the pole is made of insulating material, the antenna could be taped to the pole with electricians tape. If the pole is not 33 feet tall, the top part of the 33-foot wire could be pulled away from the top of the pole by a piece of nylon string fastened to some suitable object.

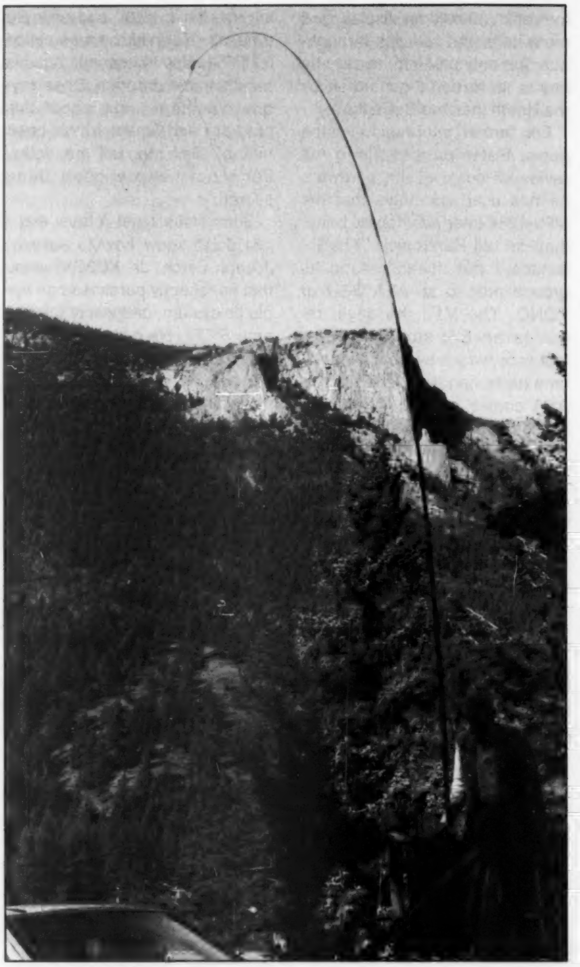


Photo B. Fiberglass fishing pole easily holds up the center of an inverted-vee antenna. W0VM stands beside it.

If one or two other poles were available, a vertical fixed-direction, wide-spaced beam could be put up. A reflector wire 35 feet long could be set up 14 feet behind the endfed antenna so that the line from the reflector to the antenna points in the desired direction. Likewise, a 32-foot wire could be positioned as a director 10-1/2 feet in front of the antenna. A two- or three-element vertical beam aimed towards Europe and located in the clear at a high elevation might well make that QRP rf output sound like 100 Watts to stations in Europe. (The vertical polarization would provide excellent low-angle radiation for "long skip.")

After the desired outdoor antenna experiments have been completed, the station can be set up in the cabin again. The OM then can operate as much as he wants to when he is "at home" in the cabin.

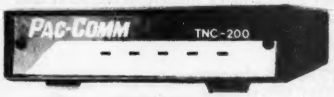
(In June, 1985, I set up a low-power station in a comfortable cabin north of Estes Park. The antenna was a 67-foot- long piece of insulated wire, the center of which was held up by a fiberglass fishing pole. With 6 Watts of rf power, I communicated with stations in St. Louis, Missouri; Dickinson, Texas; and Silver City, New Mexico, on my regular Tuesday evening net on 7.045 MHz. This was lots of fun!)

Since most "comfortable cabins" have ac outlets, the OM could bring his ac-powered home-station transceiver with him, and use it in the cabin.

Yes, you *can* take it with you on vacations, and have lots of fun!■

PAC-COMM

GIVES YOU MORE



TNC-200

- Official TAPR TNC-2 Design
- Standard AX.25 Version 2 Protocol
- Full Duplex Hardware HDLC
- 16k Battery Backed-up RAM
- 32k EPROM, Software Clock
- Latest Multiconnect Software
- Level 3 Networking Compatibility

	CMOS	NMOS
Assembled and Tested	$219.95	$199.95
Full kit w/ cabinet	$169.95	$154.95
Full kit w/o cabinet	$144.95	$129.95
Hard-to-find parts	$ 84.95	$ 79.95
Bare PC board	$ 39.95	

PTU-200

Packet Tuning Indicator/HF Modem

- Single push button selection of HF/VHF
- Active bandpass filter helps copy in QRM
- 20 segment red LED bar graph display
- Internal TAPR-design modem
- Power switch controls both PTU and TNC

Assembled and tested,Full kit
Competitively priced, call July 15

PC-100

Dual Port Packet Controller

- Dual port TNC on a half size PC card
- Use with your PC or compatible
- TNC software included
- Dual 300/1200 high performance modems
- Provisions for high speed external modem
- Use as Network Controller, Gateway, etc.

Assembled and tested......$189.95
Full kits from.................$149.95
Call about purchasing bare boards

PC-PACKET

Terminal Software for your PC

- Split screen or multi-color display
- Multiple, scrolled pages of rec/xmit buffer
- Fully configurable PC and TNC parameters
- Works with all TNC's (including GLB PK-1)
- Pop-up windows for operator interface
- User-definable function keys
- Printer/disk logging, DOS access

Available now for only......$49.95

MACPACKET

Terminal Software for Macintosh

- Pull- down menus, split screen, file xfers
- Automatic routing and more.......$69.95

FREE SHIPPING IN CONTINENTAL USA
Ask us about our volume discount program
Dealer inquiries welcome
ORDERS ONLY CALL
1-800-835-2246 ext.115 ✓44

SALES/TECH INFO CALL
813-689-3523
Fla. addresses must add 5% sales tax

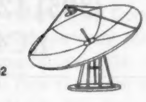
PAC-COMM PACKET RADIO SYSTEMS INC.
4040 W. KENNEDY BLVD, TAMPA, FL. 33609
TELEX 6502881526mci

THE FORMULA FOR TWO METER DX: MTT144/28R + MML144/200S = VUCC!

MICROWAVE MODULES LTD.

144 MHz 200 WATT LINEAR AMPLIFIER
144 MHz MULTIMODE TRANSVERTER

Working the two meter band on all modes is a snap with Microwave Modules. Our complete line of transverters, receiving converters and solid-state power amplifiers make it possible! Now, you can work SSB, CW, FM or AM with your HF multimode transceiver. Discover the thrill of Aurora, Tropo scatter, Sporadic-E, Meteor Scatter and even moonbounce!



THE "PX" SHACK
52 Stonewyck Drive
Belle Mead, New Jersey 08502
(201) 874-6013

✓29

16th ANNUAL

INDIANAPOLIS HAMFEST™

And INDIANA STATE ARRL CONVENTION

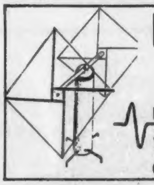
July 12-13, 1986

Marion County Fairgrounds — Gates open 6:00 AM both days

2 Full Days of:	**FREE:**
Commercial Exhibitors	Parking
Large Flea Market	Kids Awards
Hourly Awards	Camping
Forums	Womens Awards

Indiana's Largest Electronic Flea Market and Amateur Radio Display

INDIANAPOLIS HAMFEST, P. O. Box 11776, Indianapolis, IN 46201
OR CALL: (317) 745-6389



PORTAQUADS

2-MTR & 220 MHz
FOLDS INTO CASE CA. ADD
SPECIFY BAND $73.95 6% TAX

RADIO ENGINEERS
3941 MT. BRUNDAGE AVE.
SAN DIEGO CA. 92111
(619) 268-7988 ✓32

—QEP's COAXIAL SALE—

BELDEN 9913	Up to 99 ft. /39¢ft	100 ft. or more /38¢ft.
BELDEN 8214	Up to 99 ft. /35¢ft	100 ft. or more /33¢ft.
BELDEN 9258	RG-8X-$160.00/1,000 ft —.17 ft, cut	

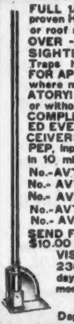
AMPHENOL Connectors & Adaptors

UG-21D	Special fit for BELDEN 9913 Cable	$3.00
UG-21D	N-type Male cable end	$4.50
PL-259	UHF Plug silver plate	1.25
UG-146/U	N plug to UHF jack	7.50
UG-83/U	N jack to UHF plug	8.50
UG-29A	N-type barrel conn.	4.75

✓30

—U.S. Geological Survey Maps—
Complete N.J. Index in stock + plus +
COMPLETE STOCK, SAME DAY SHIPPING
110-4 Route 10, E. Hanover, N.J. 07936, 201/887-6424

ALL BAND TRAP VERTICAL ANTENNAS!



FULL 1/4th WAVE - All Bands! Automatic Selection with proven Hi-Q Traps. 5 Models-ALL self supporting - Ground or roof mount. HI STRENGTH FIBERGLASS TUBING OVER -ALL. NO WOBBLY, LUMPY TRAPS - NO UNSIGHTLY CLAMPS needed - Size 1 1/4" all the way up - Traps hidden inside. You can use it in a 1 ft. sq. Backyard! FOR APARTMENTS, MOBILE HOMES - CONDOS etc. where minimum space and neat appearence is MANDATORY! Instant "Drive In" ground mount (included). Use with or without radials (included) (All angle roof mount - Extra) COMPLETELY PRETUNED - NO ADJUSTMENTS NEEDED EVER! NO TUNER NEEDED FOR MOST TRANSCEIVERS! Use - RG8U feedline, any length! 2000 Watt PEP, input power. Shipped - PREPAID IN USA. Assembles in 10 min. using only screwdriver. WEATHERPROOF!

No.-AVT80-10	5 Band	25'6"	$199.95
No.- AVT40-10	4 Band	18'9"	$139.95
No.- AVT20-10	3 Band	11'4"	$109.95
No.-AVT80-10-3	6 Band	24'8"	$229.95
No.- AVT40-10-3	5 Band	17'9"	$159.95

SEND FULL PRICE FOR PP DEL IN USA (Canada is $10.00 extra for postage, clerical, Customs) or order using VISA, MASTER CARD or AMER-EXP. Ph 1-308-236-5333 9AM-6PM weekdays. We ship in 2-3 days. All Antennas Guaranteed for 1 year - 10 day money back trial. Free Inf.

WESTERN ELECTRONICS ✓39
Dept. A7 Kearney Ne. 68847

Watch
this
Spot!

The Big "O" is coming.
Mark Your Calendar
for March 13th,
14th & 15th, 1987.
For Information call
(305) 422-ARRL
KC4CT ✓96

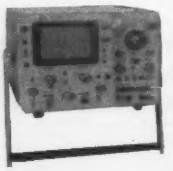
this publication is available in microform

University Microfilms International

300 North Zeeb Road
Dept. P.R.
Ann Arbor, MI 48106
U.S.A.

18 Bedford Row
Dept. P.R.
London, WC1R 4EJ
England

HEWLETT-PACKARD
1707B SCOPE



Portable dual-trace DC to 75 MHz scope with 6x10 cm display and <4.7 nS risetime. Deflection 10 mv–5 V/div in 9 ranges. Sweep 0.1 uS–2 S/div in 23 ranges; delay 0.1 uS–0.2 S/div. 7.8×12.8×16, 32 lbs sh. HP—quality at import price; used-checked w/book, ...**$795.00**

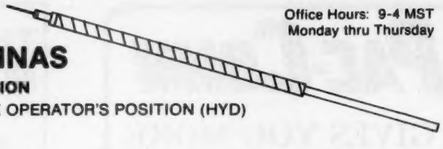
HP-851B/8551B SPECTRUM ANALYZER, popular 10.1 MHz—40 GHz unit; 60 db dynamic range. 20×16.8×18.8, 140 lbs sh. Used with BW oscillator output, ...**$1500.00**

✓75

Prices F.O.B. Lima, O. • VISA, MASTERCARD Accepted.
Allow for Shipping • Send for New FREE CATALOG '86
Address Dept. 73 • Phone: 419/227-6573

FAIR RADIO SALES
1016 E. EUREKA • Box 1105 • LIMA, OHIO • 45802

ANTECK, INC.
H.F. MOBILE ANTENNAS



Office Hours: 9-4 MST
Monday thru Thursday

TWO MODELS AND A MARINE VERSION

MT-1RT REMOTE TUNED FROM THE OPERATOR'S POSITION (HYD)
MT-1 MANUAL TUNED
MT-1A MARINE, MANUAL TUNED

All feature 3.2 to 30 MHz coverage inclusive. 1500 watts P.E.P. for hams, military, MARS, CAP and commercial service. Full output from solid state finals, no heating to waste power. RT model can be remoted up to 500 feet from antenna. Send for free brochure.

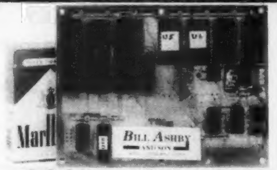
See at your local dealer or order direct if none in your area.

MT-1RT Amateur Net $309.95 ....$12.00 UPS shipping
MT-1 Amateur Net $169.95 ....$10.00 UPS shipping
MT-1A Marine $239.95 ....$10.00 UPS shipping
MT-1RTR (Retro Kit for all MT-1 Series Antenna
to convert to hyd. operated MT-1RT) $169.95 .....$9.00 UPS shipping

VISA master charge

✓64
ANTECK, INC. **Route 1, Box 415M**
Hansen, Idaho 83334 208-423-4100

PACKET RADIO



ASCII—USA/AX.25
HDLC CONVERTER

USA/AX.25 is the AMRAD approved digital format STANDARD used on amateur packet radio networks.

PAC/NET board only $80.00
Assembled/Tested. No ICs. 90 day warranty

Package of all ICs except 2-2716 EPROMs $80.00

PAC/NET SYSTEM

PAC/NET SYSTEM $240.00
System Tested 4.5 × 6" board complete with all ICs and programmed EPROMs personalized for each purchaser. Requires only single 8-10 volt ½ amp power. 1 year guarantee of hardware/software/AX.25 standard RS232 serial ASCII at any user baud rate. RS232 HDLC for 202 modem used for AFSK or direct to RF equipment for FSK.

Custom Systems Custom Programming

BILL ASHBY
AND SON

K2TKN—KA2OEG 201-658-3087
BOX 332 PLUCKEMIN N.J. 07978

Comprad

P/C Controlled Radio

Interface your commodore or Apple II PC and Kenwood's TS940, 811, 711 or 440 with COMPRAD Program all radio functions from your PC Keyboard Shortwave listeners: Station selections with one keystroke.

Two disk package and manual $49.95
(price includes shipping)
Send money orders only to:

MISIL • 50 Notre Dame Rd. • Bedford, MA • 01730
Available soon for IBM PC and Compatibles

Radio equipment
not included

Also Available ....
Floor Space: 51" Wide by 30" Deep
$199.50

. . . at last . . .
your shack organized!

A beautiful piece of furniture – your XYL will love it!

$184.50 S-F RADIO DESK

Deluxe - Ready to Assemble

Designed with **angled** rear shelf for your viewing comfort and ease of operation.

FINISHES: Walnut or Teak Stain.
Floor Space: 39" Wide by 30" Deep

Additional Information on Request.

Checks, Money Orders, BankAmericard
and Master Charge Accepted.

F.O.B. Culver City. (In Calif. Add 6% Sales Tax.)

DEALER INQUIRIES INVITED

S-F Amateur Radio Services ✓73

4384 KEYSTONE AVENUE • CULVER CITY, CALIF. 90230 — PHONE (213) 837-4870

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

THE TIME HAS COME, THE WALRUS SAID

De facto mandatory frequency coordination of amateur repeaters is now a reality, more than a decade after a repeater council in California first requested it. No, I am not blowing hot air. If you were a reader of this column back in 1972 and 1973, then you may remember an organization called the Southern California Repeater Association. Shortly after SCRA was established to coordinate repeater operation in Southern California, its leaders took the initiative to write the FCC to ask for a rule change that would require pre-coordination by a recognized frequency coordinator before the Commission issued an individual a repeater license. SCRA is no more, having been split into separate 2-meter and 1-1/4-meter councils in 1979.

For those of you new to amateur radio, or who have forgotten the way things were in the late 60s to mid-70s, it was a time when you had to request a separate repeater license from the FCC and be issued a distinctive "WR" prefix call for your system. It also meant that being a repeater licensee was a sign of extreme technological competence, since you almost had to hold an EE degree to fill out the required paperwork!

Anyway, the then leaders of SCRA felt that a legislated way of controlling repeater growth patterns was needed, and they turned to the FCC. Their request was simple and, in its day, it made a lot of sense. It also followed the FCC's own pattern of that era toward heavy-handed and highly restrictive regulation of the amateur service, so it was more than a bit of a shock to SCRA when the FCC turned it down cold. In fact, I suspect that it was the rejection by the FCC of this request that made SCRA realize that the heavy-handed repeater regulations of that era could be overturned.

While the ARRL sat dormant on the issue, SCRA took on an advocate's role that eventually led to the termination of the many restrictions that had hindered the technological advancement of this communications format. In the mid-1970s, when the FCC finally agreed to meet with representatives of the amateur community to listen to complaints about repeater rules, only the Southern California Repeater Association, represented by the Palisades Amateur Radio Club of Culver City, flew representatives to Washington for this conclave. As I remember, SCRA was represented by Capt. Richard McKay K6VGP.

You may be wondering why I tell you all this. Well, it's mainly to establish the singular fact that the portion of the amateur rules recently enacted as the result of the Report and Order on P.R. Docket 85-22 is really nothing new. While it's worded differently than it might have been over a decade ago, it is still the same basic concept that SCRA under Charles Flanagan W6OLD, Fred Deeg K6AEH (now N6FD), and several other forward-looking amateurs of the early 1970s requested so long ago. I am not going to tell you that these people were prophets. Rather, they had the ability to form a group mind that understood both the complexities of repeater coordination and human nature. They realized that only through proper regulation of FM-relay technology by the FCC—regulation based upon fairness and logic rather than flat-out restriction—could this mode grow and prosper with minimal confrontation.

Alas, the FCC chose to ignore them, and for 16 years we have suffered with what can only be called "uncontrolled" growth. We have no national band plans except on 220 MHz, and there are many cities where two meters makes the 11-meter Citizens Band seem uncrowded! Had the FCC listened to SCRA in the early 1970s, by now we might have open linking of two-meter repeaters stretching coast-to-coast and border-to-border. Instead, we have big cities where repeaters serving the same geographic area sit five or six deep on a frequency where one system would suffice far more efficiently. We have more "ego box" repeaters than we know what to do with. These are repeaters that are put up and sit unused except by the repeater owner, who chases off of "his machine" anyone who shows up. Not a private or closed repeater in the sense of restrictions on membership, but rather one placed into operation to fulfill the personal ego satisfaction of someone who needs the security of being able to kerchunk his own "box" at will, for reasons I will never understand.

So, for this writer, who has chronicled the story of FM relay communications from almost the dawning of its era, it is interesting to see the Report and Order on P.R. Docket 85-22. It is almost ironic that the FCC is enacting into regulation today what a group of hams requested some 15 years ago. I have to pause and praise the current FCC administration that looks over amateur radio affairs for being a heck of a lot more cognizant of the "real world" than their predecessors were. People like Bob Foosaner, Ray Kowalski, and Johnny Johnston W3BE are the real heart and soul of the part of the FCC that guides the amateur service. Maybe, just maybe, if they had been running the show in Washington back when SCRA made its mandatory coordination request, we would not be suffering from the chaos that we are now.

Enjoying the Hamvention '86 Banquet together are (l–r) Joe Schroeder W9JUV, Dave Bell W6AQ, Ray Kowalski of the FCC, and Steve Mendelsohn WA2DHF.

A recent letter published in *QST*'s "FM-RPT" column lauded the gigantic number of repeaters we have on the air as being a justification for our existence. Bullpucky! We exist not to prove that a fat wallet and matching ego can make us "king of the hill," but rather we exist to serve humanity. It's pretty darned hard to "serve" when you have to fight the intentional QRM of a half-dozen repeaters sharing the same channel! That's nothing to be proud of. Rather, it's sheer stupidity.

I hope that the new rules enacted as the result of P.R. Docket 85-22 will finally remedy all of this, albeit maybe too little, too late. If these new rules do, you can thank Steve Mendelsohn WA2DHF for this one. Steve probably was not aware that his work on getting FCC recognition for repeater frequency coordination was started many, many years ago at a meeting in a high-school auditorium in Los Angeles. Steve is the president of the Tri-State Repeater Council of New York, New Jersey, and Connecticut, and he was the guiding force behind P.R. Docket 85-22. His wisdom and that of those who went before him have given the rest of us a chance at a new beginning. We have the rule, but where do we go from here?

What the Report and Order on 85-22 Means

With the foregoing in mind, it is probably appropriate that it would be Steve Mendelsohn who would be the first amateur-radio media representative to learn of and question the FCC on P.R. Docket 85-22. Steve and his Sony recorder got that chance at the 1986 Dayton Hamvention, when he and FCC Special Services Bureau Chief Raymond A. Kowalski sat down to talk about the issue. While many of you probably heard it on my *Westlink Amateur Radio News* in early May, it is important that as many hams as possible know of and understand the regulatory changes that this rule-making procedure brought with it. Indeed, it affects more than repeater owners and their local coordination councils. In reality, it plays a direct role in the life of every U.S. ham who operates on VHF/UHF FM through a relay device. It affects you. With that in mind, what follows is the text of that interview:

Mendelsohn: Ray, what does the Report and Order on P.R. Docket 85-22 mean to all of us?

Kowalski: This item was adopted on April 22, 1986, and the rules go into effect on July 12, 1986. We think that there is a great deal of flexibility in the [new] rules, yet make no mistake; there's also a firm indication by the Commission that repeater coordinators perform a valuable function on behalf of everyone who wants to engage in operation in that mode, and the Commission is backing them 100%.

The important outcome of this proceeding is to establish once and for all in the amateur-radio rules, specifically Section 97.85, that when we have cases of harmful interference between repeaters or auxiliary operations, the non-coordinated repeater, if there is one involved, has the *primary responsibility to resolve that interference*!

Mendelsohn: Ray, has the Commission defined what a coordinator is?

Kowalski: Yes, we have. We have added three new definitions [to the rules]. First, there is new Section 97.3 (k) [in which] we define a coordinated station operation. That is, "the repeater or auxiliary operation of an amateur station for which the transmitting and the receiving frequencies have been implemented by the licensee *in accordance with the recommendation of a frequency coordinator*."

Now, you will note that the rule we adopted [also] spoke about harmful interference, and we have a definition for that too. *"Harmful interference is interference which seriously degrades, obstructs, or repeatedly interrupts the operation of a radio communications service."*

Finally, and perhaps most importantly, we have also defined exactly what a frequency coordinator is, and that is "*an individual or an organization [which is] recognized in a local or regional area by amateur-radio operators whose stations are eligible to engage in repeater or auxiliary operation, which recommends frequencies and, where necessary, associated operating and technical parameters for amateur repeater and auxiliary operation, in order to avoid or minimize potential interference*." The first important thing to note is that a frequency coordinator can be an individual. It does not have to be a complex organization with Articles and By-Laws, although they are OK, too. Organizations can be frequency coordinators.

Mendelsohn: What happens in an area that does not have a repeater coordinator or council, or does not feel that it has the need for one? Does that mean repeaters in that geographic region are all uncoordinated?

Kowalski: Areas with sparse populations certainly do not have to go through all of the trouble of setting up a coordinating body just so they can say they have coordinated repeaters. In fact, in the larger cities and in the urban areas where there are frequency coordinating groups, *you can still be an uncoordinated repeater—you had just better not cause interference. If you do, the Commission will look at you [as] the uncoordinated repeater.*

Mendelsohn: What effect will this Report and Order on Docket 85-22 have on Novices if they are eventually given voice and data privileges?

Kowalski: That angle was discussed in the American Radio Relay League's Petition on Novice Enhancement. [Now out for comment as P.R. Docket 86-161—Ed.] What they [the ARRL] asked was that stations in repeater operation be allowed to retransmit signals from Novice-class stations. However, Novice-class licensees could not be the control operator or the station licensee for a station in repeater operation.

In the foregoing, emphasis was added by this writer. What it adds up to is this: Neither the FCC nor a local frequency coordinator can force you to submit to frequency coordination for a repeater you now have in operation or are planning to put up. But that repeater had better not be interfering with one that has been around a longer time than yours. If it does, then you are liable for sanctions from the FCC, and this could be anything from a "nastygram" that says ". . . clean up your act" to a full-fledged Show-Cause Order aimed at license suspension or revocation in difficult cases. In the real world of big-city repeater operation, it says that the days of putting up an unsanctioned repeater are at an end. Regardless of the level of one's ego or bank account, placing a repeater into service now really means that you must obtain the approval of your peers in the local ham community before you do it, because in the real world of amateur-radio FM relay communication, failing to do so will brand you and your repeater as a "pirate" for life. The FCC says that coordination is not mandatory, but in reality it now is. Bye-bye ego-box—it's long overdue that you were buried.

Rural Input

Over the years that I have written Looking West and similar columns on FM and repeater operation, I have mainly concentrated on what's happening in the world of "big-city FM." In fact, the first five years of Looking West dealt solely with the Southern California area and the problems it faced. With the revival of this entity, I really feel that we need a broader base of informational input. A lot has changed since I began writing this column back in 1971. To this end, I am requesting that the more rural areas of our great nation stand up and be counted. You can do this by sitting down and writing to let me know what's happening in your part of the world. The stuff that's interesting will be printed. I need say no more.

Sneak Peak

Next month, in addition to FM and repeater things, you will be treated to my personal theories on the identity of the rather ill-mannered satellite-transponder jammer who calls himself "Captain Midnight." That's the guy who considers himself the "savior of the pay-TV pirates." I do not know his name or address, but I can tell you a lot about him because when he jammed HBO on the evening of April 26th, he left a calling card that any competent broadcast engineer could recognize. It will also, I hope, lead the FCC and FBI to gaining his identity and putting this fellow in jail where he belongs.■

NK6K > PACKET

Harold Price NK6K
1211 Ford Avenue
Redondo Beach CA 90278

PACKET AT DAYTON

Dayton was its usual self this year. When you put 25,000+ hams in a small area along with at least one of every piece of ham equipment under current manufacture, then add the junk swap outside, you are guaranteeing an interesting time. In addition to the more normal activities, an overheated extension cord caused enough smoke to clear one building for an hour on Saturday, and an electrical problem cut the juice to most of the arena almost all day on Sunday.

Ray Kowalski, head of the Special Services Division of the FCC (which includes amateur radio), and John Johnston, who is directly concerned with amateur rule-making, were there, as well as at least one employee of the enforcement division. It seems that all hams have some sort of subliminal sixth sense that tells them Uncle Charley is near. I saw Ray Kowalski walking around and looking at various displays in the crowded arena, but even under packing densities that would make a megabit RAM-maker cringe, Ray had a clear buffer zone of about 20 feet around him—as if he were shielded by a portable "line of death." Whether it was a chill wind, raised hairs on the back of the neck, or something else, I can't say; I had no such aura and was trapped in the crowd flow, which rapidly carried me out of sight.

The FCC guys have a tough row to hoe. On one hand, they are interested in what's going on and in our thoughts on regulatory issues. On the other hand, various court decisions have enjoined them from receiving comments on pending actions outside of the official comment channels—i.e., in personal conversation. This puts them in the embarrassing position of sometimes having to say, "I can't hear this," such as at the FCC forum, when someone in the crowd insisted on commenting, even after he had been asked not to—repeatedly. The proper way to comment on rule-making actions is later—as in this month's column.

Speaking of the FCC forum, if you were in Dayton and didn't attend, shame on you! Johnston and Kowalski went over many of the recent and pending FCC actions that affect amateur radio. This included the Novice Enhancement NPRM (notice of proposed rule-making), which would give Novices some digital privileges, and 85-105, the automatic control of packet docket.

They also used the forum to remind us once again that a phone call to the FCC with the question "Is this legal?" is usually a bad idea. Ray Kowalski said, with tongue only partially in cheek, that he has ordered the staff to always respond to that question with a "no." The fact that you are calling, said Kowalski, means that there is some doubt in your mind, and that "no" is the easiest response. As far as I know, a phone opinion is just that, an opinion, and is not legally binding.

New Products at Dayton

If you have made no attempt to chart the growth of packet radio other than to keep your eyes open at Dayton, it is still easy to see packet's increasing effect on amateur radio. This year there were eight booths in which packet was either the only topic or was the centerpiece of the items on display, and most of the dealers had packet equipment for sale. Falcon was selling a packet amplifier. ICOM had a radio that was advertised as packet-compatible. AEA was showing off its HF modem and had HF packets from Italy, Spain, and Norway pouring in. This was even more impressive to the West Coast crowd which usually sees "exotic" calls only on OSCAR 10. There were several packeteers active from the parking lot and flea-market areas. Packet forum coordinator Bob Neben K9BL did a good job this year and scheduled two separate forums on packet—one introductory and one advanced—and both were well attended.

The following is a list of the packet-related products shown for the first time at Dayton. The old standbys, or products that have been out for a while, aren't mentioned. Some of the new ones were still in prototype form. These are not product reviews, and none are necessarily recommended by your humble scribe—I haven't seen most of them in action yet.

Before the
Federal Communications Commission
Washington, DC 20554

The topic goes here	)	
	)	PR Docket No.
	)	
	)	RM-
	)	

For example:

Before the
Federal Communications Commission
Washington, DC 20554

In the matter of	)	
Amendment of Part 97 of the	)	PR Docket No. 85-105
Commission's Rules to permit	)	
automatic control of amateur	)	RM-4879
radio stations.	)	

Fig. 1. FCC petition header.

AEA

AEA has been one of the most active manufacturers, providing both new software and new hardware capabilities. This year was no exception. The PM-1 HF modem was previously announced, but just started to be shipped in April. This is a unit that can be added to any TNC, and by all reports it is a hot performer. As I said above, it was in use on their demo table, pulling in the DX.

Brand new at Dayton was the AEA PK-232, a Morse/Baudot/ASCII/AMTOR/packet box; it's similar to the PK-64, but it plugs into any computer with a serial port. It comes in two models—one with a modem (PK-232) and one without (UDC-232). A working model was on display. The packet software includes multi-connect and other advanced features, as well as some wrist-slapping messages when you set beacons and timing parameters to channel-hogging values. By the time you read this, these units should be out. No price was announced, but expect to pay more than the cost of packet-only units.

AEA was also showing off a new product that fixes one of the few complaints they've had with the PK-64. The short (too short) flat shielded ribbon cable connecting the PK-64 to the C-64 computer has been replaced with a 24-inch-long shielded flexible cable. This, along with a few software tweaks and an option to include an enhanced HF modem, is sold as the PK-64A. The higher cost of the fancy cable is reflected in the unit's higher price—$269. You can send in your PK-64 and get the new cable put on, but be prepared to pay $70 for the cable, the shielded connector, and the labor. AEA will pay the return shipping.

GLB

GLB has also been busy. A prototype of a 9600-baud rf modem (modem and radio in one box) was on display. High-speed modems will be an important part of the higher-level networks we'll be seeing in the coming months. "How fast can the radio port run?" is one of the questions you should ask when determining which TNC you want to buy. I expect to see many packeteers running faster than 1200 baud as soon as modems become available. GLB did not have a price for their modem, but said it should be ready for beta testing in six to eight weeks.

GLB also had a new TNC on display. This one will be available in the late summer of 1986. Called the PK2, it combines the features of the PK1 and the TNC2A, GLB's TNC-2 clone. In my view, the major fault of GLB's first packet offering, the PK1, was its software HDLC. This limited its radio port to 1200 baud, and also kept it from watching the keyboard and the radio at the same time, in what some have called "quarter-duplex." The new unit fixes this, and its information sheet says, "Full HDLC hardware—no compromises." The user also has the choice of the GLB-style commands or the TAPR TNC commands. GLB's handout had two pages of new hardware and software features. The PK2 will also have the capability to control the frequency on GLB's 9600-baud rf modems. Keep your eye on conventions and ads, as I expect that GLB and AEA will square off in a full-fledged feature war.

ICOM

I'll bet you didn't expect to see ICOM in the packet product list, did you? Neither did I, but on a walk past their booth, I spotted the words "packet-compatible" on the glossy for a new 2-meter radio, the IC-28H. Tom Moore and Jim Newcombe up at ICOM in Washington state tell me that "packet-compatible" means that special care was taken in the design of the radio to ensure a quick transmit/receive turnaround time. They said they believe it to be on the order of 50 ms.

Faster switching time is a good thing. It both increases frequency utilization and reduces the collision window. The shorter the time between when your TNC decides to transmit and when a signal is actually on the air, the less chance there is that someone else will decide the frequency is clear. Thanks go to the ICOM engineering staff for thinking of us, and kudos to the ICOM marketers for realizing the word "packet" sells. A free mention in the column goes to the first person to actually measure the turnaround time on the IC-28H/A and send it in.

MFJ

The MFJ TNC-2 clone, advertised for many months, made its debut a week before Dayton, and a few were in stock with dealers. At a quick glance it seems to be a faithful rendition of a TNC-2. It's in a different cabinet, and TTL levels are brought to a connector in the back for non-RS-232 serial ports.

Micrologs

A large sign at the Microlog booth asked, "When is Microlog going to get into packet?" When I asked, the answer was, "We're not sure." The gentleman at the booth must have been asked that question hundreds of times, because the answer was a bit terse. It was Sunday but, on the other hand, it *was* their sign. I gathered that they missed the deadline for showing a packet product at Dayton, a state with which I am well acquainted. Keep an eye on Microlog; their unit may be out by the time you read this.

Pac-Comm

Pac-Comm had a bare board called the PC-100 for show-and-tell. This is a plug-in card for IBM-PC and PC-compatible computers. It has a Zilog 8530 HDLC chip and two AMD7910 modems. With software running on the PC, this puts a dual-port TNC on the PC's bus. This is based on a design by Terry Fox and the AMRAD gang. The PC-100 will be available in July. Pac-Comm was also selling a split-screen terminal package for the PC.

QSKY

Jim Grubbs K9EI of QSKY Publishing has written an introductory-level book on packet called *Get *** CONNECTED to Packet Radio*. It avoids technical details, which is good for an intro, and it includes a large bibliography that points the reader to the more scholarly tomes. The book also contains a large list of packet clubs and other organizations.

TAPR

The big attraction at the TAPR booth was a pin-and-yarn map of North America showing digipeater paths. Everyone who was anyone on packet stopped by to make sure his area was appropriately marked on the map. There wasn't enough time to get a photo of the map in this issue; look for it later.

TAPR had HF tuning-indicator kits for use with TNC-1 or TNC-2 clones. They also had a new introduction to packet video tape. This was done after hours on the news set in a TV studio in St. Louis. An all-ham technical staff was used for the taping. The tape includes "news" quality graphics, runs in just under half an hour, and features packet's best-known video personality, Pete Eaton WB9FLW. The tape is $10 and is not copyrighted.

TAPR also announced that the TNC-2 software source is now a part of the TNC-2 OEM package, and that it would be made available to everyone for noncommercial use in the near future. TAPR's Network Node Controller prototype was also on display.

That's the Dayton report for this year. The revolution rolls on, and it's gaining speed.

DISAGREE WITH WAYNE

Here's a chance to disagree with Wayne. It was rumored at Dayton that Wayne was talking to a group of hams in the crowd and said that maybe there wasn't enough interest among *73* readers to justify a packet column. Maybe he didn't say that, or maybe he was playing devil's advocate, but what the heck, drop him a line and tell him he's wrong anyway.

There was also a rumor that the smoke that cleared the Dayton building on Saturday wasn't an extension cord, but rather was spontaneous combustion caused by a stack of Wayne's editorials. I tend not to believe this, as they looked as if they were stacked a safe distance apart to me.

LETTERS

The first letter about *73*'s new packet column arrived while I was at Dayton. Larry Morgan K7LX wrote to ask for more information about the group in Hamilton with the PC plug-in board. I sent the following off in his SASE:

"The Hamilton Area Packet Network is selling a PC card that features a Bell 202 modem, a watchdog timer, and an 8273 hardware HDLC chip. Software running on the PC turns the board into an internal TNC. The HAPN-1 PC-Packet Adapter, assembled and tested with AX.25 host software, is $199. The address is Box 4466, Station D, Hamilton, Ontario, Canada L8V 4S7."

PETITIONING THE FCC

There are just a few simple rules to follow when you petition the FCC. Rule number one: Make sure people can read your petition. This means type it if at all possible and double-space it. Rule number two: Make some copies and send them along. Send the original and at least five copies. If you want maximum exposure, send an original and 11 copies. Rule number three: Use the standard header on the first page. See Fig. 1 for an example of this header. Mail this petition to the Secretary, Federal Communications Commission, Washington DC 20554. There are many timings involved as to when you can comment, when you can respond to comments, and when you can petition for reconsideration. If you have questions on such items, call the ARRL—dealing with the FCC is one of its major activities.

A detailed description of how to petition the FCC or comment on various FCC actions is given in *The FCC Rule Book*, published by the ARRL. See pages 2-12 through 2-16 in the 1986 edition (green cover).

If you are petitioning the FCC on a packet matter, please send a copy to the ARRL Digital Committee. It's one way we can keep abreast of what's happening, and it's a good way to indirectly notify other organizations such as TAPR, AMRAD, and AMSAT. All of us working together can get things done. The best thing to do is coordinate with the committee before you file, since a request similar to yours from someone else may already be winding its way through the mill. Knowing about it can help you make a better informed presentation of your own to the FCC. You are, of course, free to petition or comment with no coordination, or even file in opposition to the digital committee and other organizations.

WRAPUP

I promised to talk about the IC-02AT, but I've run out of space. I'll cover that and the TH-21AT next month. I also said I'd talk about the automatic control petition, but Dayton took up all the room. Just goes to show that you can't believe everything you read. See you next month. ■

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

WHISTLING IN A GRAVEYARD

New York City is full of unique pleasures.

One of these is walking through graveyards. No, I'm not talking about tuning through the upper portion of the AM broadcast band, but honest-to-goodness actual graveyards.

If you have a map of New York handy, whip it out and take a look at the Middle Village-Glendale area. You'll find these amusingly bucolic-sounding towns near the center of the borough of Queens. Although placed inside one of the nation's largest cities, these neighborhoods have managed to keep a suburban flavor by being virtually surrounded by cemeteries. It's a nice, quiet area.

Anyway, my favorite graveyard is located in Brooklyn—Green-Wood Cemetery. Back in the 19th century, it was very fashionable to stroll through Green-Wood's gardens. Although the practice has sort of died out over the years (excuse me), it still can be a fun way to spend a lovely spring day. Just me, my HT, and a few silent friends.

You can find more celebrities lying down in Green-Wood than standing up in Manhattan. Some of the notables I've visited include Horace Greeley, Peter Cooper, Lola Montez, "Boss" Tweed, and William S. Hart. Quite a cast. But I recently reserved a few moments to visit with my favorite Green-Wood resident, Samuel F. B. Morse.

"Sam," I whispered, "the philistines are out to dump your code from ham radio. They say it's keeping newcomers from the hobby."

"Ham what?" replied Sam. I forgot—radio came along after Morse's demise. I filled him in on the details.

"Well, I never was much good at the darn code stuff myself," grumbled Sam. "Couldn't get much above 8 words per minute, actually. God may have wrought the telegraph, but I think a lower force was behind the code."

Sam seemed pleased that we were still using his code after so many years.

"It's a good system," he remarked. "After all, seeing as how you can't talk over wires, it's still the best way to communicate."

When I informed Sam that we can now indeed talk over wires and the air and send written messages as well, he seemed confused.

"Then why use the code?" he asked.

"Tradition," I replied. Sam then muttered something about horse transportation being more traditional than the telegraph, and asked me to move along. He told me to talk to neighbor Charlie Ebbets, of baseball park fame, if I wanted to discuss tradition. He also mentioned something else about horses that I didn't quite catch.

Comdex vs. Dayton

I hate the people who run the Comdex personal-computer industry trade show. This year, once again, I was forced to miss Dayton to cover Comdex for another publication. Therefore, instead of looking at all the new rigs, swapping DX gossip, and shaking hands with HBO's Captain Midnight, I was forced to fly to Atlanta to talk with computer vendors, distributors, and retailers. Zzzzzz.

Incidentally, the PC market may be following the downward path of ham radio. This year's show featured both fewer exhibitors and attendees. IBM has driven a lot of fun out of the personal-computer business, and we're seeing the results. There weren't a heck of a lot of imaginative products at the show.

Nevertheless, some of the handful of interesting devices at Comdex had their roots in ham radio. I saw a number of wireless modems that drew a lot of their technology from packet-radio devices.

Also, many manufacturers were touting wireless local area networks (LANs). LANs are networking systems that tie together an office's computer work stations and peripherals. A LAN lets employees share data, printers, modems, storage devices, and so on.

Wireless LANs, quite obviously, need radio frequencies to do their thing. A number of LAN makers at the show were literally drooling over our underutilized VHF/UHF frequencies as a possible home for their systems. I heard one company's representative come right out and state that he would like to take away a portion of 220 for his firm's LANs. Incidentally, he described 220 as "an empty band that's assigned to a CB-like service but is hardly used."

Just what ham radio needs, another business interest after our frequencies.

The Puzzle

Callsigns can be fun. Bootleggers have been using them for decades. Ever speak to RG8U from Belden? Yuk, yuk.

David Flynn AA4MN of Nashville, Tennessee, has sent along a quiz that's comprised of funny calls.

His puzzler asks you to match fictional calls with the professions of hypothetical operators. In order for the puzzle to work, the numeral also has to stand for a letter: 0 for O and 1 for I. For example, an American ham in the Midwest who is a dairy farmer might end up with the call K0WS, or a saucy Swedish stewardess might get SM1LE.

Take care, some of the answers are quite subtle.

QUESTIONS

1. A Polish cook: __ __ 1 __ __ __
2. A Sardinian garbageman: __ __ 0 __ __ __
3. A Saudi Arabian judge: __ __ 0 __ __ __
4. A Japanese prison guard: __ __ 1 __ __ __
5. A Lebanese garbageman: __ __ 0 __ __
6. A Belgian shallot farmer: __ __ 1 __ __ __
7. A dentist in the Netherlands: __ __ 1 __ __
8. An Egyptian hog farmer: __ __ 1 __ __ __
9. A Chinese robotics engineer: __ __ 0 __ __ __
10. A Sudanese meteorologist: __ __ 0 __ __ __
11. A Haitian Santa Claus: __ __ 0 __ __
12. A Gabonese laxative distributor: __ __ 0 __ __

ANSWERS

1. SP1CES
2. IS0RES
3. HZ0NER
4. JA1LER
5. 0D0RS
6. 0N1ONS
7. PA1NS
8. SU1PIG
9. BY0NIC
10. ST0RMY
11. HH0H0
12. TR0TS

The ISOTRON NO TUNERS! NO RADIALS!
ANTENNAS FROM 160-10 METERS NO COMPROMISE!

Just a few comments from our satisfied customers:

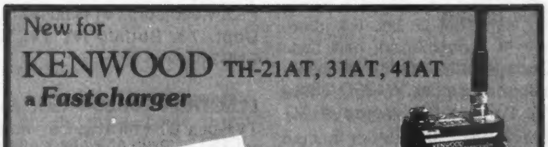
"...I have used your 80/40 [illegible] ron while stationed in Guantanamo Bay Cuba and [illegible] KB6SY Dept. Of The Navy"

"On January 11 and 12 I go[illegible] into the [illegible] azine ssb contest. I didn't try for ma[illegible] num[illegible] er of cont[illegible] ather I tried for maximum numb[illegible] states. [illegible] less tha[illegible] s total time I worked 32 st[illegible] a[illegible] uerto [illegible] co, that is [illegible] bout a 2500 mile haul [illegible] Auro[illegible] Color[illegible] o.
Not to[illegible] ad for wha[illegible] ooks l[illegible] a bird fe[illegible]"

"I just got my Isot[illegible] n 40 o[illegible] the air an[illegible] sed my wildest expectations[illegible] y fir[illegible] evening QSO[illegible] with KB6EUC and wait—my secon[illegible] was w[illegible] h HK3GUP in Columbia, South America. The [illegible] its on [illegible] 20 foot mast and that is it. My RST report[illegible] great.
Congra[illegible] eveloping the Isotron. I am spreading the good wo[illegible] am friends. I think it's a super compact antenna w[illegible] inally come!...KA5O[illegible]"

"About two [illegible] ught an Isotron [illegible] and just recently got it out of th[illegible] foot pole. I am really intrigued by it an[illegible] t of fun trying to convince other stations that it is o[illegible] igh. I worked California when it was hanging by a [illegible] the ceiling of the shack and it works even better [illegible] N8EDF" (Photo: Isotron 160)

[illegible] NOT ENJO[illegible] OPERATING PLEASURE & GIVE US A CALL. WE WILL LOOK FORWARD TO TALKING WITH YOU.
*40-METER - $52.95 PLUS $3.75 SHIPPING 80-METER - $63.95 Plus $4.75 Shipping
160-METER - ~~$149.95~~ SALE! $129.95 + $5.50 shp Good through Sept. 30, 1986
80-40 Combination - $110.00 plus $8.50 Shipping
ASK FOR PRICES ON OTHER MODELS
*See review in October 73, 1984 **See review in March 73, 1986
BILAL COMPANY ✓42
S.R. 2, Box 62, Dept. 91
Eucha, OK. 74342 PH: 918-253-4094



New for
KENWOOD TH-21AT, 31AT, 41AT
a Fastcharger

Save $15.00 when ordering charger with accessories kit.

SPECIAL SALE!
~~$54.95~~
Now $49.95
+ $3.00 shipping and handling
FL res. add 5% sales tax

Features:
•Charges in 15 minutes •12v–14vdc input
•Automatic Voltage cut-off •No memory
•Battery doesn't heat-up •Proven in daily use

Optional AC adapter with DC and mobile cords available ~~$10.95~~ $9.95

Charge-Rite ✓46
Call and talk with Paul WB4WIC or Dr. "S", WA4DRV
P.O. Box 4175, Vero Beach, FL 32964 (305) 476-8580

BARTER 'N' BUY

Individual (noncommercial) .... 25¢ per word
Commercial .... 60¢ per word

Prepayment by check or money order is required with your ad. No discounts or commissions are available. Please make your payment to *73*.

Advertising must pertain to amateur radio products or services. No special layouts or positions are possible. All advertising copy must be submitted typewritten (double-spaced) and must include full name and address. Copy limited to 100 words, maximum. Count only words in text. Address, free.

73 cannot verify advertising claims and cannot be held responsible for claims made by the advertiser. Liability will be limited to making any necessary corrections in the next available issue.

Copy must be received in Peterborough by the 5th of the second month preceding the cover date.

Make checks payable to *73* Magazine and send to: Hope Currier, *73* Magazine, WGE Center, Peterborough NH 03458-1194.

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 60-page catalog, $3.00. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90815. BNB045

HAM RADIO REPAIR, tube through solid state. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128; (408)-729-8200. BNB219

QSLs to order. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

THE DX'ERS MAGAZINE. Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DXCC Honor Roll Certificate 2–4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

INDIVIDUAL PHOTOFACT FOLDERS. #1 to #1400, $3 postpaid. Loeb, 414 Chestnut Lane, East Meadow NY 11554. BNB312

IMRA—International Mission Radio Association. Forty countries, 800 members. Assists missionaries with equipment loaned, weekday net. 14.280 MHz, 2:00–3:00 p.m. Eastern. Brother Bernard Frey, 1 Pryer Manor Road, Larchmont NY 10538. BNB326

ELECTRON TUBES: receiving, transmitting, microwave—all types available. Large inventory means next-day shipment in most cases. Daily Electronics, PO Box 5029, Compton CA 90224; (213)-774-1255. BNB330

RADIO TRANSCRIPTION DISCS WANTED. Any size, speed. W7FIZ, Box 724–WG, Redmond WA 98073-0724. BNB347

CABLE CONVERTERS. Lowest price. Dealer inquiries accepted. Quantity discounts. Free catalog. P.G. Video Corp., 61 Gatchell St., Dept. 73, Buffalo NY 14212. BNB349

ELECTRON TUBES—Radio and TV types. 80% off list price—huge inventory! Also, industrial types. Send for free catalog today or call toll-free (800)-221-5802. Box SC, Transleteronics, Inc., 1365 39th St., Brooklyn NY 11218. BNB370

NEW PATENTED ANTENNA INVENTION DESIGN delivers 30 dB gain over a dipole. Total parts cost under $10 and construction is simple. This antenna works extremely well on all bands, 80 through 10 meters, including the new WARC bands. For complete postpaid antenna construction manual, send only $20 to: R. Christie, 215-28 Spencer Ave., Queens Village NY 11427. BNB382

CABLE TV CONVERTERS and equipment. Plans and parts. Build or buy. For information, send SASE to C & D Electronics, PO Box 1402, Dept. 73, Hope AR 71801. BNB383

QSL CARDS: 100 for $6.25 and 500 for $20.00 postpaid—SASE for a sample: Ken Hand WB2EUF, PO Box 708, East Hampton NY 11937. BNB388

SURPLUS AND MORE SURPLUS. Thousands of items, free bargain-packed flyers. ETCO Electronics, Plattsburgh NY 12901. BNB399

XEROX MEMORYWRITER—parts, assemblies, boards, manuals. Free help with service problems. W6NTH, Box 250, Benton AR 72015; (501)-776-0920. BNB404

DOCKING BOOSTERS—Fantastic 30-Watt (50-Watt with GaAsFET preamp) console amplifier for your VHF or UHF hand-held transceiver, from $129.95. Write for free catalog of all our communication products. Skywave Radio, Box Q-1, 943 Boblett, Blaine WA 98230. BNB407

HAM TRADER YELLOW SHEETS, in our 24th year. Buy, swap, sell ham-radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. $10.00 for one year (24 issues). PO Box 2057, Glen Ellyn IL 60138-2057. BNB412

C-64, VIC-20, TI-99/4A, TS-1000, TS-2068 Software. Catalog $1 *refundable*. Turn your programs and public-domain software into PROFIT$. Steve's Software Source, 9922 Harwich, Crestwood MO 63126-2318. BNB421

QSL CARDS—Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, 310 Commercial, Emporia KS 66801. BNB434

KENWOOD 430S OWNERS! Stop Scan stops the scan on busy channels. After they clear, scan continues automatically! Reviewed *73* 2/85. $19.95 (assembled $29.95). Shipping $2.50. JABCO, R1 Box 386, Alexandria IN 46001. BNB438

NEW Spectrum Analyzer/Monitor Receiver kit $60. Send SASE for details. Science Workshop, Box 393, Dept. 73, Bethpage NY 11714. BNB440

MARCO—Medical Amateur Radio Council, Ltd. Operates daily and Sunday nets. Medically oriented amateurs (physicians, dentists, veterinarians, nurses, physio-therapists, lab technicians, etc.) invited to join. Presently over 550 members. For information, write MARCO, Box 73's, Acme PA 15610. BNB441

ATTENTION Kenwood TS-430S, ICOM 745 and 751, Yaesu FT-757GX owners! Modification for general-coverage transmit the right way. Send $3 for each to W. Thomas, PO Box 96, Uniontown PA 15401. BNB445

1986 "BLOSSOMLAND BLAST" Sunday, October 5, 1986. Write "BLAST," PO Box 175, St. Joseph MI 49085. BNB446

YAESU OWNERS—Hundreds of modifications and improvements for your rig. Select the best from 14 years of genuine top-rated Fox-Tango Newsletters by using our new Comprehensive Index. Only $4 postpaid with Rebate Certificate creditable toward Newsletters purchases. Includes famous Fox-Tango Greensheet and Filter information for your rig (if specified). N4ML, FTC, Box 15944, W. Palm Beach FL 33416; (305)-683-9587. BNB448

C-64 AND C-128 SOFTWARE: Send SASE for list. PO Box 387, Chillicothe OH 45601. BNB449

MORSE CODE. Send Wordstar documents as Morse code over computer's internal speaker. SASE for details, $7 for unprotected disk for IBM-PC and compatibles. AA4PG, 478 Cahaba Landings Road, Birmingham AL 35210. BNB450

K7NH SATELLITE-TRACKING PROGRAMS with world map and real-time operation. Fastest and easiest to use full-featured programs available. Hundreds sold. Timex and VIC-20, $15. C-64, $18. IBM, $24. N H Enterprises, 22104 66th Ave. West, MTLK TERR WA 98043. BNB453

BEAM HEADING CHART: 10-page report in binder with 9 data fields calculated from your exact QTH to over 540 DX locations. $9.95 from John Daley KB6JGH, PO Box 4794, San Jose CA 95150. BNB454

SATELLITE TV-MICROWAVE interference a problem? The Orvis Technology OTI microwave filter

is designed to be effective when the interfering microwave is carrying video. The filter is installed in the 70-MHz line at the receiver and is power passing. Try one! Money-back guarantee if not satisfied. $50 Canada. $40 U.S. (Add $2 shipping and handling.) Orvis Technology, 203 Philip Street, Dryden, Ontario P8N 1N7 Canada; (807)-223-6500. BNB455

COMPUTER PROGRAMS for the Commodore. Antenna design, Morse instruction, logging, and others. SASE for brochure. Uncle Bill's Software, Box 2403, Falls Church VA 22042. BNB456

CODE TEST BLUES? Let E-Z-R code cassettes solve your problem. Audio tape set for Novice, General, or Extra—just $10.50. New proven method. Details for an SASE. JERLS, PO Box 1193T, Bedford VA 24523. BNB457

TOWER CLIMBING SAFETY BELTS and accessories. Free specs. Avatar Mag., 1147 N. Emerson #7, Indianapolis IN 46219-2929. BNB458

WANTED: meter for Gonset GSB-100 transmitter. Gary Embler, 732 College Ave., Palo Alto CA 94306; (415)-424-1483. BNB459

CONTESTS

Robert W. Baker WB2GFE
15 Windsor Drive
Atco NJ 08004

CANADA DAY CONTEST
Starts: 0000 UTC July 1
Ends: 2400 UTC July 1

Sponsored by the Canadian Amateur Radio Federation (CARF), the contest is open to all amateurs and everybody works everybody. Entry classes include single operator allband, single operator single band, and multi-operator allband.

Use all bands from 160 to 2 meters on CW and phone combined. All contacts with amateur stations are valid. Stations may be worked twice on each band—once on CW and once on phone. No cross-mode contacts are allowed.

EXCHANGE:

Signal report, consecutive serial number starting with 001, and province. Do not use a separate series of numbers on each band.

SCORING:

Score 10 points for each contact with Canada, 4 points for contacts with others. VE0 counts as Canada and one multiplier. Score 20 bonus points for each contact with any CARF official station using the suffix TCA or VCA. That means an official station counts 10 points plus 20 bonus points for a total of 30 points!

Multipliers are the number of Canadian provinces/territories worked on each band, on each mode (13 provinces/territories per band and mode maximum). Contacts with stations outside Canada count for points but not multipliers.

Provinces and territories are: VO1/VO2, VE1-NB, VE1-NS, VE1-PEI, VE2, VE3, VE4, VE5, VE6, VE7, VE8, VE0, and VY1.

FREQUENCIES:

1.810, 1.840, 3.525, 3.775, 7.025, 7.070, 7.155, 14.025, 14.150, 21.025, 21.250, 28.025, 28.500, 50.040, 50.110, 144.090, and 146.52. Suggest phone on the hour, CW on the half hour. Since this is a Canadian-sponsored contest, remember to stay within the legal frequencies for your country!

AWARDS:

Certificates will be awarded to the highest score in each category in each province/territory, in the U.S.A., and in each DXCC country. Additionally, trophies will be awarded to the top single-op allband and multi-op allband stations.

ENTRIES:

A valid entry must contain log sheets, dupe sheets, a cover sheet showing claimed QSOs, QSO points, a list of multipliers, and a calculation of final claimed score. Cover sheets and multiplier check lists are available. Entries should be mailed within one month of the contest, with your comments to: CARF Contest, c/o N. Waltho VE6VW, Box 1890, Morinville, AB, Canada T0G 1P0.

Results will be published in *TCA, The Canadian Amateur* magazine. Nonsubscribers should include an SASE for copy of the results.

IARU HF CHAMPIONSHIP
Starts: 1200 UTC July 12
Ends: 1200 UTC July 13

The IARU Administrative Council meeting in Melbourne/Aukland in November, 1985, resulted in several changes in this year's contest. Note the name change this year as well!

The three basic changes include: a 24-hour contest period for both single- and multi-operator stations, all bands between 1.8 and 30 MHz may be used with the exception of the 10-, 18-, and 24-MHz bands, IARU member/society headquarters stations count as additional multipliers and will be recognized by their unique exchange.

This contest is open to all licensed amateurs worldwide. The object is to contact as many other amateurs in as many parts of the

CALENDAR

Jul 1	CARF Canada Day Contest
Jul 12–13	IARU HF Championship
Jul 19–20	*CQ* Worldwide VHF WPX Contest
Jul 26–28	MARAC County Hunters CW Contest
Aug 2–3	ARRL UHF Contest
Aug 16–17	New Jersey QSO Party
Aug 16–17	New Mexico QSO Party
Sep 13–14	ARRL VHF QSO Party
Oct 11–12	Rio CW DX Party
Nov 1–2	ARRL Sweepstakes—CW
Nov 8	ALARA Contest
Nov 15–16	ARRL Sweepstakes—Phone
Dec 5–7	ARRL 160-Meter Contest
Dec 13–14	ARRL 10-Meter Contest
Dec 28	CARF Canada Contest
Jan 3	*73*'s 10-Meter World SSB Championship
Jan 10	*73*'s 15-Meter World SSB Championship
Jan 11	*73*'s 20-Meter World SSB Championship
Jan 17	*73*'s 40-Meter World SSB Championship
Jan 18	*73*'s 75-Meter World SSB Championship
Jan 24–25	*73*'s 160-Meter World SSB Championship

THE TSRAC BNT

NEWSLETTER OF THE MONTH

One of our favorite newsletters makes its second appearance in the NOTM corner this month, *The TSRAC BNT*. This incredible book is the chronicle of the Triple States Radio Amateur Club of Adena, Ohio, and is edited by, well, *you* try to find the editor's name! We couldn't.

The *BNT* violates just about every rule of proper publication. Pages are laid out with all sorts of strange typeface combinations, the text is crooked, photos and figures are pasted down wherever they will fit. But it's FUN to read. In the end, that's all that counts. (Incidentally, we also couldn't figure out what BNT stands for.)

To enter your newsletter in *73*'s Newsletter of the Month Contest, send it to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: Newsletter of the Month.

world as possible using the bands specified above.

Operating categories include:

A) Single operator: phone, CW, and mixed-mode sections. One person performs all operating and logging functions. Use of spotting nets is prohibited. Single-operator stations are allowed only one transmitted signal at any given time.

B) Multi-operator: single transmitter, mixed-mode only. Only one transmitted signal allowed at any given time and you must remain on a band at least 10 minutes at a time. All operators must observe the limits of their license at all times. Only IARU member/society HQ stations may operate simultaneously on more than one band, with one transmitter on each band/mode. Only one HQ station's callsign per member/society is permitted on each band.

Stations may be worked once per band/mode; crossmode, crossband, and repeater QSOs do not count.

EXCHANGE:

IARU member/society HQ stations will send signal report and official IARU member/society abbreviation. All others send signal report and ITU zone.

SCORING:

Count 1 point for each QSO within your ITU zone as well as for each IARU HQ member/society station, 3 points within your continent but different ITU zone, and 5 points with different continents. Multipliers are the total number of ITU zones plus IARU member/society HQ stations worked from all bands. Final score is total number of QSO points times the total multiplier.

ENTRIES:

All entrants are encouraged to use forms available from IARU/ARRL Headquarters; send an SASE or one IRC. Logs must indicate times in UTC, bands, modes, calls, and complete exchanges. Multipliers should be clearly marked in the logs. Cross-check sheets are required if more than 500 QSOs are made. Entries must be postmarked by August 13th; any entry received after mid-October may not be in time to be included in the printed results. Usual conditions of entry and disqualifications apply. Entries should be addressed to ARRL Headquarters, 225 Main Street, Newington CT 06111.

AWARDS:

A certificate will be awarded to the high-scoring CW, phone, mixed-mode, and multi-operator entrant in each state, ITU zone, and DXCC country. In addition, achievement-level awards will be issued to those making at least 250 QSOs or having a multiplier of 50 or more. Additional awards may be made at the discretion of each country's IARU society.

CQ WORLDWIDE VHF WPX CONTEST

Starts: 0000 UTC July 19
Ends: 0000 UTC July 20

This event is sponsored by *CQ* Magazine with SCORE, the Society of Contest Operators and Radio Experimenters of Denville, New Jersey, being the administrative head of the contest committee. In this international VHF/UHF competition, multipliers are prefixes and there are eight levels of competition in each geographic area.

Classes of entry include: single operator, single band; single operator, allband; single operator, single band, low power; single operator, allband, low power; multi-operator, single band; multi-operator, allband; portable (with temporary power source); and FM-only.

Low power is defined as 30 Watts PEP output or less. All transmitters must be located within a 500-meter diameter or within the property limits of the station licensee's address, whichever is greater. The antennas must be connected by wires to the transmitters.

Use all authorized amateur bands and frequencies from 6 meters through 23 cm (50, 70, 144, 220, 432, 902, and 1296 MHz). All modes are allowed for contest credit (as authorized by local law and license class).

A prefix is considered to be the three-letter/number combination which forms the first part of an amateur radio callsign. A station in a callsign area different from that indicated by his callsign is required to sign portable. Special-event, commemorative, and other unique prefix stations are encouraged to participate.

EXCHANGE:

Callsign and "Maidenhead" locator grid square (four digits—e.g., FN20). Signal reports are optional and need not be included in the log entry.

SCORING:

Score 1 point per QSO on 50, 70, or 144 MHz; 2 points per QSO on 220 and 432 MHz; 4 points per QSO on 902 or 1296 MHz. Work stations once per band, regardless of mode. Multiply total QSO points times total number of prefixes worked on each band.

AWARDS:

Engraved trophies will be awarded to the top-scoring stations in each category and major geographic area where competition is indicated. Parchment certificates suitable for framing will be awarded to top-scoring stations in each category and minor geographic area where competition is indicated. Certificates may also be awarded to other top-scoring stations that show outstanding contest effort.

ENTRIES:

Contest entries must be postmarked no later than August 31st to be available for awards. Logs should be mailed to the *CQ* VHF WXP Contest, c/o SCORE, PO Box 1161, Denville NJ 07834, or to *CQ* Magazine, 76 N. Broadway, Hicksville NY 11801.

CW COUNTY HUNTERS CONTEST

Starts: 0000 UTC July 26
Ends: 0200 UTC July 28

MARAC invites all amateurs to participate in this year's contest. All mobile and portable operation in less active counties is welcomed and encouraged. Stations may be worked once on each band, and again if the station has changed counties. Portable or mobile stations changing counties during the contest may repeat contacts for QSO points.

EXCHANGE:

QSO number; category (P for portable, M for mobile); RS(T); state, province, or country; and U.S. county. Stations on county lines give and receive only one QSO number, but each county is valid for a multiplier for the receiving station.

FREQUENCIES:

3.575, 7.055, 14.065, 21.065, and 28.065. On 20 and 40 meters, mobile and portable stations should call CQ or QRZ below the suggested frequencies; fixed stations should call CQ or QRZ above the suggested frequencies.

SCORING:

QSOs with fixed stations are 1 point; QSOs with portable or mobile stations are 3 points. Multiply the sum of all QSO points times the number of U.S. counties worked. Independent cities may be counted as any one of their adjoining counties in accordance with USACA rules. Mobiles and portables calculate their score on the basis of total contacts within a state for the state certificate, and calculate their score on all operation if they operated from more than one state in competition for the High Portable or High Mobile plaque.

AWARDS:

Certificates will be awarded in three categories:

F) Highest fixed or fixed-portable station in each state, province, and country when total score exceeds 1,000 points.

P) Highest station in each state operating portable from a county that is not its normal point of operation, when total score exceeds 1,000 points.

M) Highest station in each state operating mobile from three or more counties (with a minimum of 10 QSOs in each of three counties).

Plaques will be awarded to the highest mobile, portable, and fixed stations in the United States that meet the above requirements for certificates. Additional awards will be issued when deemed appropriate.

ENTRIES:

Logs must show category, date/time in UTC, station worked, band, exchange, QSO points, location, and claimed score. All entries with 100 or more QSOs *must include a check sheet of counties worked or they will be disqualified from receiving awards*. Enclose a *large* SASE if results are desired. Logs must be postmarked by September 1st and sent to: Jerry Burkhead N6QA, 7525 Baltic Street, San Diego CA 92111.

ABOVE AND BEYOND

Peter H. Putman KT2B
84 Burnham Road
Morris Plains NJ 07950

As this is being written, the last days of winter have gone by and spring is well along, bringing the first thunderstorms of the year and with them the attendant sporadic-E (Es) conditions that make six meters so much fun to operate during contests!

The 1986 ARRL June VHF QSO Party will long be history by the time you read this, but no doubt some Es will have been observed during the festivities and many new grids worked. It's long been a truism that if you really want to make a big score in this particular contest, you can't neglect six meters. I'll briefly relate some of the details of an operation our contest group undertook in the 1984 June VHF QSO Party under the callsign K2XR.

This was intended to be a major effort, with kW amplifiers on each of four bands—50, 144, 220, and 432 MHz. In addition, we ran 100 Watts on 1296 MHz. All of the stations used stacked yagis on good-sized towers, and the location was far enough away from prying eyes, man-made interference, and noise so as to ensure a reasonably quiet operation. Our six-meter station in particular was designed for maximum effort: It used an ICOM 551D driving a home-brew 4-1000A amplifier at the legal limit. This in turn fed two KLM 50-LD 7-element beams stacked on a 70-foot tower/mast combination.

Well, the conditions were certainly ripe for Es! This had to be one of the hottest weekends I've ever spent anywhere, and being at 1400' ASL didn't help one bit. The mercury went over the 100-degree mark several times during the weekend and stayed there, baking our crew unmercifully. We consumed gallons (and I *mean* gallons) of beverages over the weekend just to stay cool. Every fan we could employ was put into service, and most of the crew never had more than a pair of shorts on all weekend, even at night. It was *that* hot.

With the sustained high temperatures and reports of thunderstorm activity across the nation, it was only a matter of time before we would get our first big opening. But we didn't expect it to come Saturday night. Sure enough, here were S9++ signals coming in from Nebraska, Texas, Missouri, and Florida. We couldn't get them into the log fast enough.

A Janel 50-MHz MOSFET preamp helped immensely with the receiver, and the amplifier made it possible to bag extra contacts when meteor scatter was present during the wee hours of the morning. The Es opening had pretty much died down by that time, although Es can happen around the clock. Since conditions on the other bands were pretty punk, we concentrated on six meters as much as possible.

That is, until the preamplifier blew up. The intense pounding of rf from the 4-1000A proved to be too much and the preamp made an early exit Sunday morning, complete with the attendant puff of smoke. Conditions were so good by this point due to another Es opening that we really didn't need it anyway! Stations were calling us from Florida, Kansas, the Carolinas, and Oklahoma. Our group certainly was benefiting from the line of thunderstorms in the South, even if we weren't getting any of the cooling rain that came with them. Temperatures remained in the high 90s and many operators went into a cool cellar just to get back into mid-70-degree air.

Our finest hour came on the final night when we bagged additional stations in Alabama, Mississippi, Texas, and North Dakota. All of this was capped off by a contact with the Bahamas! In many cases, K2XR was the only station responded to by these operators after repeated CQs. The 4-1000A behaved very well (although it detonated its plate choke halfway through the weekend) and was the difference in some of the scatter contacts and the weaker Es grids worked. The stacked beams also helped since the angle of radiation during both Es and scatter contacts was relatively low.

Remember, though, that you don't have to run lots of power to take advantage of this phenomenon! Many times the Es is so localized and is intense enough to allow QRP contacts in the 400–600-mile range with ease—sometimes even further. Many owners of IC-502s have been lucky to work into the deep South and Caribbean during such conditions, all with no more than 3 Watts to a whip antenna. If you haven't given six meters a try lately, then a portable operation with 10–100 Watts might just be the ticket.

Keep in mind that in many instances Es on six has provided the only excitement during an otherwise routine June VHF QSO Party. It's a great way to work those rare grids, not to mention rare prefixes during the July *CQ* WW VHF WPX. Generally, the storms that provide the best openings usually occur over the mid-continent area, although storm systems in the deep South will usually provide pretty good openings.

One radio that meets our requirements nicely is the aforementioned IC-551D. This unit is still manufactured by ICOM and features an 80-Watt final with dual vfo's and multimode operation. The difference with the 551D is that it was intended to be first and foremost an SSB/CW rig, with FM thrown in as an afterthought, so the receiver performance on weak signals is very good. An outboard preamp is highly recommended, and it is easily connected via the rear-panel RCA jacks for "RCVR IN" and "RCVR OUT." You'll have to tap into the 551D for a source of 13.8 V dc.

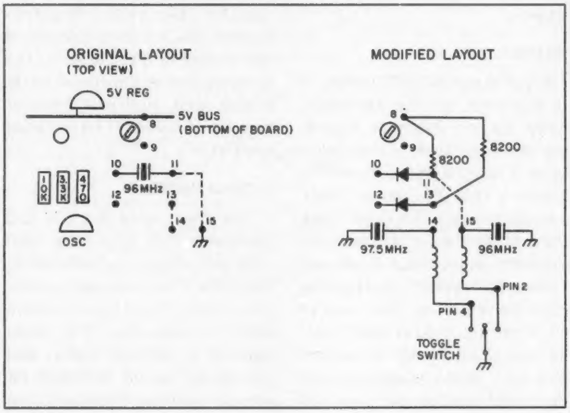


Fig. 1. VE3CRU's modifications to allow dual-range crystal switching on the MMT 220/28.

1. *Remove 96-MHz crystal from pins 10 and 11.*
2. *Remove 10k resistor.*
3. *Install 1N914 diode from pin 10 to pin 11 with cathode at pin 10.*
4. *Install 1N914 diode from pin 12 to pin 13 with cathode at pin 12.*
5. *Remove ground wire from pin 15.*
6. *Install 10-uH choke from pin 15 to DIN socket pin 2.*
7. *Install 10-uH choke from pin 14 to DIN socket pin 4.*
8. *Install 96-MHz crystal from pin 15 to PC foil ground.*
9. *Install 97.5-MHz crystal from pin 14 to PC foil ground.*
10. *Install 8.2k resistor from pin 8 to pin 11.*
11. *Install 8.2k resistor from pin 8 to pin 13.*
12. *Install SPDT center off toggle switch on connector panel above DIN socket.*
13. *Connect center pin of switch to ground.*
14. *Connect pin 2 of DIN plug to one side of switch.*
15. *Connect pin 4 of DIN plug to other side of switch.*

Theory of operation—The crystals are coupled to the oscillator-transistor base via a switching diode. One of the crystals is disabled by grounding the appropriate pin on the DIN socket or by using the toggle switch. The diode on the inactive crystal will be back-biased about 1 volt, thereby disabling it. Using a toggle switch to change the crystals directly is not recommended since the stray capacity across the switch is sufficient to permit oscillation. The toggle switch can be used to select frequency. In the center off position, frequency selection is done remotely by grounding the proper pin on the DIN socket.

(Incidentally, ICOM also made a 10-Watt version of this radio, called the 551, which is still available on the surplus and hamfest market.)

However you choose to do it, six-meter operation can be extremely satisfying. Concerned about TVI? Go mountaintop portable, or even mobile, for the contest. ICOM also makes the only six-meter portable on the market, the IC-505, with a choice of 3 Watts output using internal batteries or 10 Watts with an external supply. Used with a small car or RV battery, it makes an excellent weekend station, especially with an outboard 100-Watt amplifier such as the Mirage A1015. If the Es is good, go barefoot, and you'll be amazed at what you can hear when the propagation works for you!

More 220

Now I can report to you 220 enthusiasts that there is another way to get more mileage out of your station. For those using the Microwave Modules MMT 220-28 transverter, simply replacing the 96-MHz LO crystal with a 97.5-MHz crystal will yield a conversion of 220–225 MHz down to 25–30 MHz. If you are currently using one of the newer low-band general-coverage radios, you need to enable the set for general-coverage transmit. *Caution:* Don't attempt to run power out of the authorized amateur bands. You will need about 10–50 mW of drive in the range of 25–30 MHz to make the conversion work, and this shouldn't cause any problems in a closed-loop system to the transverter.

I have performed this modification with my MMT 220-28 and am now able to work SSB, CW, and FM (plus repeaters) with one source, running 15+ Watts output. The only catch is that you have to program the repeater inputs and outputs separately, but I use only two or three machines on 220 anyway and this isn't much of a bother. Plus, it yields the popular 223.50 simplex frequency and there's plenty to work here. If you choose not to convert your unit or can't (such as IC-730/740 users, TS-820/830, etc.), then there is at least a way to get on simplex FM by using the crystal switching scheme shown in Fig. 2. This circuit is courtesy of Hans Peters VE3CRU, who is making it standard equipment on all MMT 220-28 units made after March 1, 1986. If you are limited to the 28–30-MHz i-f range, you'll at least have coverage of the 223–225 segment and can work simplex for FM or packet. This frees your HT for other uses and buys superior weak-signal performance on the low end of the band as well.

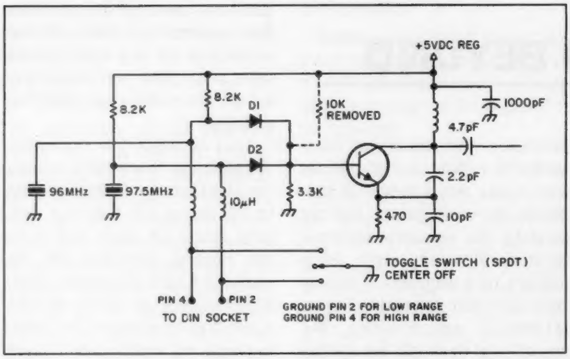


Fig. 2. Schematic of the dual-range modification.

Mailbox

Fred Church WA5YOV writes in to comment on the February, 1986, column statement regarding attenuator pads. He wants to know if using a pad between his Heathkit HW-104 and an MMT 144-28 to drop the drive level from 1 Watt down to about 50 milliwatts would result in less receiver conversion gain going back the other way. Well, first of all, Fred, the typical MMT 144-28 has about 20 dB of conversion gain, which is usually more than adequate for your low-band receiver. If you employ the transceiver connection at 28 MHz and put a pad in the line, your drive level on transmit and conversion level on receive will both be reduced.

Using a 6-dB pad will result in a drive level of 250 mW, which is fine for the MMT 144-28. It will reduce your conversion gain to about 14 dB, which is still plenty for the HW-104. Note what your S-meter readings are when listening to 144 MHz with no pad present and in no-signal condition. I'll bet that your S-meter is sitting at around S1 or even S2. Losing 6 dB of conversion gain will bring it back to about S0, which is where you want it anyway! Remember, this has no effect on the received signal at 144 MHz, although many users seem to be confused on this point. Such an attenuator could be picked up at a flea market or made up from three 150-Ohm, 1/4-Watt, carbon-composition resistors.

Fred's concern is that dropping the drive level inside the HW-104 might affect the linearity of the signal, especially on SSB. This method of cutting the drive shouldn't affect the linearity at all, since the 1 Watt of rf output is looking into a fairly nonreactive 50-Ohm load. Enough of the energy is dissipated by the resistors to bring the drive down to a safe level. And your receiver conversion shouldn't be impaired one bit.

Contest Update

The new rules for the *CQ* Worldwide VHF WPX have been released, which is no surprise to me since I was involved in their formulation. For those readers who took some time off to throw together a portable station and get on during the festivities (or who just operated from their home station from ac mains), here are the details: The date—July 18–20, the format—48-hour contest period, and the allowable bands—50, 70 (Europe), 144, 220, 432, 902, and 1296 MHz. The eight categories of competition stay the same (single/single, single/multi, single/single QRP, single/multi QRP, multi/single, multi/multi, portable, and FM-only). The big difference is that grid squares are now included as the exchange and will replace the serial number from last year.

If you don't know or care about your grid square, a location report or signal report will suffice. This information has no effect on the final score, which is still solely determined by prefixes worked. Many stations wrote in to request the grid-square multiplier, so they could continue collecting grids for VUCC on various bands. This is really a fun contest and ties in perfectly with May's column on portable operation, since there are specific classes for QRP and portable competition. I'll certainly be on and hope to work you as well!

Good News

The popular K2RIW 19-element 432-MHz yagis are once again being manufactured after a long layoff and are available from Tom Rutland K3IPW at 1703 Warren Street, New Cumberland PA 17070. This antenna uses exceptional construction, including a soldered driven element. It's priced at $69.95 in kit form plus UPS charges.

Not Again?

I've just received the latest newsletter from the Mt. Airy VHF Radio Club, otherwise known as the PackRats (not to be confused with the AEA product with a similar name!). This club has had a stranglehold on the January VHF Sweepstakes Unlimited class for the past 25 years or better. Why? Because this is an active, involved club whose members travel to all sorts of crazy places to put signals on the air, from 50 MHz right up to 10 GHz! What's more, they really enjoy it, too. I've been to a few meetings and can tell you that this club takes its VHF and UHF activity seriously.

For example, a total of 59 logs were sent in to the club to be posted with the Club Aggregate Score in the Unlimited class. How'd they do? Only about 1.8 million points, that's how! The ARRL ought to change the name of this class to the PackRat Contest Demo class, for theirs is an excellent example of how to organize a large group effort successfully. Others have tried, but the Mt. Airy folks keep plugging along, year after year. Many hams on the East Coast are familiar with their annual VHF conference and flea market which occur the first weekend in October. In addition, the club also runs VHF nets on 50 through 1296 each Monday night, starting at 7:30 p.m. EST. Check-ins come from as far away as North Carolina and Maine! It's a great way to find activity to test out that new piece of gear or to evaluate station improvements.

I'll have a piece down the road on this active radio club. For those who might like more information, the newsletter is very well done and can be had by writing to the editor, Harry Stein W3CL at 2087 Parkdale Avenue, Glenside PA 19117.■

73's Powerhouse Sweepstakes

Official Entry Form

YES! Enter my name in the *73* Powerhouse Sweepstakes and my subscription to *73 Amateur Radio* for the term checked:

☐ **One year for $19.97** ☐ **Two years for $34.95**

☐ **Check Enclosed** ☐ MC ☐ VISA ☐ AE

Card# __________ Exp. Date __________

☐ No, I do not wish to subscribe now, but please enter my name in *73*'s Powerhouse Sweepstakes.

Name __________ Call __________

Address __________

City __________ State __________ Zip __________

NO PURCHASE NECESSARY—ENTER TODAY

Offer valid only in U.S., its territories and possessions. Please allow 4–8 weeks for delivery of first issue.

2676W

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS MAIL PERMIT NO. 33 PETERBOROUGH, NH

POSTAGE WILL BE PAID BY ADDRESSEE

73 Amateur Radio

CIRCULATION DEPT.
WGE CENTER
70 RTE. 202 NORTH
PETERBOROUGH, NH 03458-9995

WIN!

YOU CAN WIN THIS RIG
and have 2m CLOUT in *73's* Powerhouse Sweepstakes!

KENWOOD
TM-2570A
144MHz FM TRANSCEIVER
AL
PRIO
LAMP
REV
SCAN
LOW
CO
TO PUSH ON
CS
C.SQ
RESET
CHL
DCL
VOL
SQL
POWER OFF
F.LOCK
ON AIR
M.CH
PAIR 16-17 18-19
PHONE
TONE
VOICE

Grand Prize:
Kenwood's 70-Watt TM-2570A 2m FM transceiver

Wouldn't you like to own the hottest 2m rig on the market? Kenwood's TM-2570A pumps out an amazing 70 Watts of rf from 142–149 MHz—all the power you need to hit everything that you can hear. You'll have 23 memories at your fingertips for instant recall of frequencies, repeater offsets, subaudible tones, and telephone numbers—the VS-1 Voice Synthesizer will keep you posted on what's where. Does the TM-2570A scan? You bet it does—memory scan and programmable band scan (with priority alert) are standard. You'll also get Kenwood's exclusive Digital Channel Link System, a CD-10 Call Sign Display, and a PS-50 20-Amp power supply for operating at home.

How can you win this top-of-the-line system? Just complete the attached entry card or the coupon below. No purchase is necessary.

Be an instant winner! Check the **YES** box on your entry card to start your subscription to *73* at our special introductory price—just $19.97 for 12 months; you'll save 44% off the regular cover price!

OFFICIAL RULES
(No Purchase Necessary)

1. On an official entry form or a 3" x 5" piece of paper, hand print your name, address, and zip code. Enter as often as you wish, but mail each entry separately to *73's* Powerhouse Sweepstakes, Circulation Department, 70 Rte. 202 North, Peterborough, NH 03458. Entries must be received no later than July 31, 1986. The drawing will be held by August 30, 1986. All entries become the property of *73 Amateur Radio*, which reserves the right to print the name and address of the winner.

2. Winner will be selected in a random drawing from among all entries received, under the supervision of the publisher of *73 Amateur Radio*, whose decision will be final. Only one prize will be awarded in this Sweepstakes. Winner will be notified by mail and may be required to execute an affidavit of eligibility and release. Odds of winning will depend on number of entries received. The publisher of *73 Amateur Radio* will arrange delivery of prize. Taxes are the responsibility of the winner. Any manufacturer's warranties will apply, but the publisher makes no warranties with regard to any prizes. Prize is not transferable. No substitution for prize.

3. Sweepstakes open to all residents of the U.S., its territories and possessions, who are at least 18 years old, except employees (and their families) of the publisher of *73 Amateur Radio*, its affiliates, and its advertising and promotion agencies and Trio-Kenwood Communications. Void where prohibited or restricted by law.

4. For the winner's name, send a stamped, self-addressed envelope to *73 Amateur Radio*, Circulation Department, 70 Rte. 202 North, Peterborough, NH 03458.

☐ **YES!** **Enter me in *73's* Powerhouse Sweepstakes and start my subscription to *73 Amateur Radio* for the term checked:**

☐ One year for $19.97
☐ Two years for $34.95

Mail to:
73's Powerhouse
Sweepstakes
Circulation Dept.
70 Rte. 202 North
Peterborough, NH
03458

Check Enclosed MC VISA AE

Card#__________ Exp. Date__________

☐ No, I do not wish to subscribe now, but please enter my name in the *73 Amateur Radio* Sweepstakes.

Name__________ Call __________
Address__________
City__________ State__________ Zip__________

Offer valid only in the U.S., its territories and possessions. Please allow 4–8 weeks for delivery of first issue. [illegible]

73 INTERNATIONAL

Just because I started this column as a result of visiting DX hams is no reason you shouldn't put in your 2¢ worth and let me know what DX news you find most interesting. My inclination is to have DX ops tell us what they think is interesting—how we can get permission to operate if we're fortunate enough to visit—any coming DXpeditions—what's doing with repeaters—things like that. What do YOU find most interesting? Since we have a world hobby, I think you'll be as interested as I in what is going on. If nothing else, it gives us something to talk about on the air which, from what I'm hearing these days, can't hurt.

—Wayne.

BRAZIL

Gerson Rissin PY1APS
PO Box 12178 Copacabana
20000 Rio de Janeiro, RJ
Brazil

Carlos Vianne Carneiro PY1CC
Rua Afonso Pena 49, Apt. 701
20270 Rio de Janeiro, RJ
Brazil

FOR DX MEMBERS

After five years, I visited the city of Fortaleza again. It is located in the State of Ceara northeast of Brazil, and like all Brazilian cities located along the coast, Fortaleza has paradisiacal beaches. Due to its location in South America, it is one of the best places in the world for DXing. So, the PT7 stations are quite active and are always looking for a rare spot on the bands. Most of them are members of a DX club called Fortaleza DX Group (FOR DX), which maintains a special VHF spotting frequency. Every member knows about a DXpedition or a very wanted station on the air. On this trip, I found DXers like Luc PT7WA, Eli PT7BZ, Pergentino PT7AA, and Freire PT7WZ, old friends I didn't know personally before.

Luc PT7WA (formerly PY7VNY) was one of the first Brazilians to get the 5-band DXCC. He is still very active on the low bands, and is now looking for the 5-band WAZ. Eli PT7BZ and Freire PT7WZ work phone only. Pergentino PT7AA is most active on CW.

Eli's DXCC score is now 292 but he already has the 5-band DXCC and 5-band WAS. Now he is working for the 5-band WAZ and needs only a few zones on 80 meters to finish it. His last interest is the 160-meter band, where he already has 82 confirmed countries. Eli showed us his shack where he displays a few rigs—almost one for each band. PT7BZ confirms all QSOs with his QSL, but if you need a direct QSL you can ask him for it at PO Box 2875, Fortaleza, 60000 CE, Brazil.

CWJF AWARD

Sponsored by the CW Group of Juiz de Fora, the CWJF is available to all licensed amateurs for confirmed contacts with five stations located in the city of Juiz de Fora after January 1, 1985, on any amateur band. Only two-way CW contacts count. The same station may be worked on different bands but with a minimum interval of 24 hours. Send GCR log of stations worked (call, date, time, band, mode, and report) and 10 IRCs to: CWJF Award, PO Box 410, 36100 Juiz de Fora, MG, Brazil.

There are no special endorsements for the CWJF Award.

SWL: Same rules.

CWJF members: PP1AEA (PY4CZ), PU4WAS (PU8), PU4WIG, PU4WLF, PU4XFD, PU4XIA, PY4AG, PY4AKR, PY4ALC, PY4ALV, PY4AMP, PY4EG, PY4EM, PY4CY, PY4QA, PY4QE, PY4QV, PY4RU, PY4YN, PY4ZAX (KA2UFT), and PY4ZF.

de PY1APS/PY7APS

NEW BANDS FOR BRAZIL

New radio-amateur services, approved by Decree number 91.836, will take effect on October 12, 1986, allowing Brazilian radio amateurs to operate two of the three new bands, the 18.068–18.168-MHz and the 24.890–24.990-MHz segments, both on a shared basis until January 7, 1989, after which they will be exclusively for radio-amateur operations.

Only Class-A Brazilian operators are allowed to use these new bands, and these are allowed emission types for these bands: N0N, A1A, A1B, A1C, A1D, F1A, F1B, F1C, F1D, A2A, A2B, A2C, A2D, F2A, F2B, F2C, F2D, J2A, J2B, J2C, J2D, A3A, A3B, A3C, A3D, A3E, H3E, J3B, J3C, J3D, J3E, J3F, R3A, R3B, R3C, R3D, R3E, and R3F.

The third band is not yet allowed for radio-amateur use because government safety services and aeronautics services are still using it and there was not enough time to change frequencies and equipment. As soon as these services move to other frequencies, authorities will allow the remaining new band to be used by radio amateurs. We'll pass along the word.

de PY1CC

COSTA RICA

Bengt Hallden TI4BGA
Box 999
3000 Heredia
Costa Rica

73 International welcomes Costa Rica and Senor Hallden, who has been appointed by the directors of the Radio Club de Costa Rica to keep us all informed of amateur-radio events and developments in that country.

Amateur radio in Costa Rica is definitely growing very fast, and licensing is increasing rapidly. HF as well as VHF traffic on the different amateur bands involve more and more Costa Ricans.

The 2-meter band is the most popular, and there are more or less 12 repeaters covering the whole territory, including one channel for autopatch. If you are interested in the different repeaters' frequencies, write the RCCR at TI0RC, Apartado Postal 2412 San Jose 1000, San Jose, Costa Rica.

Regarding licensing proce-

Photo A. PT7BZ's QTH.

Photo B. L to R: PY1APS, PT7AA, PT7BZ, and PT7WA.

dures here in Costa Rica, especially for visiting tourists, it is not very complicated. I would say rather that it's a quick operation as long as all the required documents are in good order. Costa Rica has a reciprocal agreement with the U.S.A. (and Austria, Argentina, Brazil, Venezuela, Chile, Peru, Canada, Mexico, Panama, Switzerland, Belgium, Bolivia, Nicaragua, Ecuador, Belize, Dominican Republic, and the Federal Republic of Germany), thus enabling the tourist to operate from here more or less the same day he arrives.

A must, of course, is the presentation of a valid amateur license when applying for a reciprocal license.

The only exception for the use of your reciprocal license is that it isn't permitted from the Isle of Cocos (TI9). However, if someone should be interested in operating from Cocos Island, arrangements can be made with the RCCR and, if accompanied by some local ham, operation might be possible.

The RCCR has a QSL Bureau with monthly dispatching of QSL cards. Third-party traffic is possible, and special callsigns for prefix hunters are mostly appearing during international contests when TI1 and TE2-TE8 can be heard—also TE1.

Regarding certificates and awards, the RCCR is sponsoring the TTI Award (see below). Any SWL or amateur can obtain this after hearing/contacting seven of the eight call areas of Costa Rica. (The club station, TI0RC, can replace any absent call area.) Send GCR list to me (Sr. Hallden is RCCR treasurer and Diploma Manager) with 10 IRCs or U.S. $5.

The idea of DXpeditions with 20 hams visiting Costa Rica sounds very interesting and, of course, operating possibilities when arriving and during a stay here are guaranteed; in other words, such a group of hams would be very welcome! Just let us know!

The RCCR phone number is 216903, and our office in San Jose is on the central avenue between 1st and 3rd Streets near Hotel La Gran Via. You may call me at 395372, Luis Retana at 220545 or 530393, or Jimmy Vincent at 210012 during office hours.

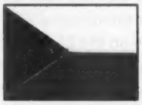
DIPLOMA FRACAP

The Federation of Radio Amateurs of Central America and Panama (FRACAP) announces a beautiful diploma for radio amateurs and SWLs to raise interest in the member countries of Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama.

Requirements are: two-way confirmed contacts after August 16, 1985, any band, any mode, with each of the six countries, with amateurs who are members of a FRACAP radio club.

The application has to be accompanied by the QSL cards or a GCR list verified by the radio club of which the applicant is a member. Applications should be accompanied by 10 IRCs or U.S. $5 and should go to the RCCR Awards Manager at the address above.

73 and Health!



CZECHOSLOVAKIA

Rudolf Karaba (OK3KFO ARC)
Gogol'ova 1882
955 01 Topol'cany
Czechoslovakia

Annually in Czechoslovakia the best individual stations, as well as those of radio clubs in the competitions on shortwave, are being evaluated. For the year 1983, the following results were achieved:

Radio clubs
OK1KRG—75 points (the maximum)
OK1KSO—69 points
OK3KCM—55 points

Individuals
OK2FD—75 points
OK2BHV—63 points
OK1AVD—61 points

RTTY

The operators of radio club OK3KJF made contact with station A92DU from Bahrain island. It was their 109th DXCC list country. They work with the machine T-100 and ground-plane antennas and HB9CV.

Station OK1DNH from Rotava works on RTTY by using a ZX-81. The ZX-81 works without any problems on the lower bands, but on the higher bands it has some problems with RFI.

A very nice placement was achieved by Czechoslovakian stations in the category of multi-operators in the Alexander Volta RTTY Contest 1984. The first three places were occupied by OK3KGI, OK3RMW, and OK3KEF.

UHF/VHF

OK1VRF encountered a signal of station OE5XUM on the frequency of 144.595 MHz on May 11, 1985, at 5 p.m. UTC. The station was located in the mountains near Salzburg as a radio-teleprinter converter, by modulation F1B, shift being 850 Hz, input of 80 Watts.

RTTY transmission has begun for the station of the Central Czechoslovak Radioclub, OK1CRA. The transmission is in the shortwave band as well as through converters in the UHF band.

After two years an experimental marathon SNERA has ended. In this marathon, the Soviet radioamateur stations were competing to make as many contacts as possible on UHF bands by means of a polar glow.

The category of individuals was won by: UA3BMJ—155 contacts via polar glow for 5,442 points, UR2RQ—139 contacts for 3,795 points, and UA9XQ—149 contacts for 3,159 points.

The category of collective stations was won by radio club UZ9CXM with 23 polar-glow contacts, and the SWL category was won by UA3-142-198 with 9 polar-glow contacts.

Photo C. Ed OK3EY (ex-OK3TCA), one of Czechoslovakia's best DX men.

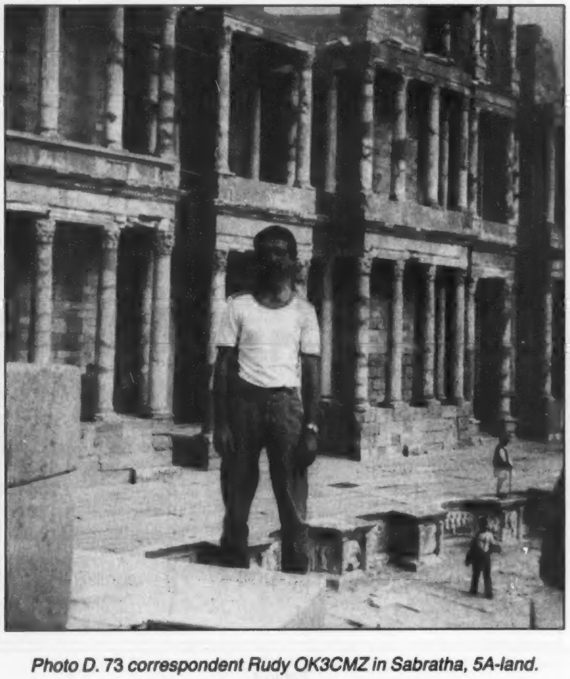


Photo D. 73 correspondent Rudy OK3CMZ in Sabratha, 5A-land.

DX

LY4L has a special antenna that was transmitting from Ulianovsk in 1985 on the 112th anniversary of the birthday of V. I. Lenin.

QRP

Igor OK3CUG belongs to the friends of the operation with small inputs, which made 1,300 QRP contacts on the 3.5-MHz band, 840 of which had output of 600 milliwatts. Igor was working with 40 lands according to the DXCC list, the rarest being W1, CT2, UF, and UA9.

Jirka OK1FAO has been working mainly on 3.5 MHz. He used equipment of his own construction with aninput of 2 Watts and made 600 contacts.

The callsign OK1DCP is known from many QRP contests. Franta belongs to the most active operators with QRP in Czechoslovakia. Since 1976 he has made more than 5,300 contacts on the 160- and 20-meter bands. These contacts were made with homemade equipment with an output of 3 to 5 Watts. He has been specializing on the 7-MHz band, operating CW.

Jan OK3ZAP has constructed a homemade CW/SSB transceiver for 3.5 to 21 MHz with an output from 120 milliwatts to 5 Watts. On the 21-MHz band he has worked as many as 55 lands on the DXCC list.

Jarda OK3AUI is a very active QRP operator. With his equipment of 5 Watts input, since 1980 he has made approximately 5,000 contacts, 1,000 of which were on SSB.

Olda OK1DAV works with QRP of his own production with an input of 0.5 to 8 Watts. With wire antennas, operating CW, he worked 50 DXCC lands. In the *CQ* WW DX Contest, he made contacts for the diploma WAC during 12 hours on the 21-MHz band.

Jirka OK1MYN works with QRP on the 14-MHz band with his CW/SSB transceiver with an output of 4 Watts. He worked 74 DXCC lands.

ITALY

Manuel F. Calero I4CMF
Manager, IARS
Reciprocal Licensing Unit
Via Giorgione, 16 I
40133 Bologna
Italy

The following has been extracted from material dated January, 1986, provided by Signore Calero. He may be addressed as above or telephoned (from inside Italy: 051 389502; international number: 0039 51 389502). Phone calls are answered in English, Spanish, and French between 8 and 10 p.m. UTC, except weekends.

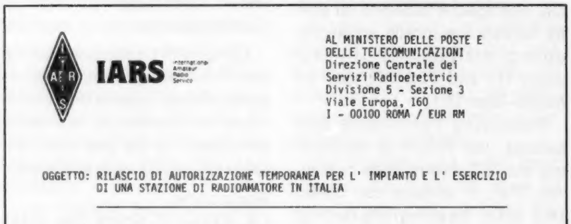
Amateurs from the following countries are eligible for nonextendable three-month permits for brief vacation or study visits: Austria, Belgium, Canada, Cyprus, Denmark, France, Federal Republic of Germany, Great Britain, Greece, Iceland, Ireland, Liechtenstein, Luxembourg, Malta, Monaco, Netherlands, Norway,

WINNERS OF THE 1984 OK-DX CONTEST (XXVIII)

Top five stations worldwide:

Call	QSOs	Points	Multipliers	Totals
Single-op—multiband				
UA1DZ	1,351	2,118	83	175,794
LZ2WF	1,302	1,738	92	159,896
HA7UO/P	1,198	1,445	98	141,610
RB5MF	1,166	1,856	67	124,352
UH8EAA	1,072	1,556	76	118,256
Multi-op—multiband				
OK5R	1,552	1,547	115	177,905
OK6RA	1,237	1,228	110	135,080
UZ4FWO	1,117	1,813	62	112,406
UB4QWW	900	1,464	63	92,043
OK1KSO	1,012	1,006	90	90,540
Single-op—1.8 MHz				
LZ2BE	281	426	14	5,964
YU4YA	162	334	10	3,340
UP2BLF	172	330	7	2,310
G3ZRH	128	241	8	1,928
UB5REN	103	204	9	1,836
Single-op—3.5 MHz				
UP2BM	576	929	13	12,077
YO3CD	556	837	13	10,881
HA6NL	539	805	13	10,465
Y27IO	521	748	13	9,724
Y56YF	495	774	12	9,288
Single-op—7 MHz				
HA1XR	690	857	32	27,424
UA2FFC	654	839	30	25,170
LZ2SC	853	750	27	20,250
LZ1SS	541	686	29	19,894
LZ1NG	514	665	29	19,285
Single-op—14 MHz				
OK1TN	565	565	34	19,210
UA4PNW	381	697	24	16,728
I2VXJ	431	534	30	16,020
SM2DQS	417	683	21	14,343
OH6QU	346	594	23	13,662
Single-op—21 MHz				
UA0SAU	394	531	20	8,620
UA3TU	95	100	19	1,900
UA4HLD	106	155	12	1,860
LU4FDM	134	201	6	1,206
LZ1TD	57	62	19	1,178
Single-op—28 MHz				
JO1CRA	30	28	9	252
OK2BEW	10	10	6	60
OK3CPY	1	1	1	1

Table 1.



IARS International Amateur Radio Service

AL MINISTERO DELLE POSTE E
DELLE TELECOMUNICAZIONI
Direzione Centrale dei
Servizi Radioelettrici
Divisione 5 - Sezione 3
Viale Europa, 160
I - 00100 ROMA / EUR RM

OGGETTO: RILASCIO DI AUTORIZZAZIONE TEMPORANEA PER L' IMPIANTO E L' ESERCIZIO DI UNA STAZIONE DI RADIOAMATORE IN ITALIA

Il sottoscritto chiede a codesto Ministero di voler rilasciare una concessione temporanea per l' impianto e l' esercizio di una stazione di radioamatore in Italia. Trascrive qui di seguito i dati personali richiesti:

COGNOME e NOME: (surname and name) ....

DATA di NASCITA: (date of birth) .... giorno (day) .... mese (month) .... anno (year)

LUOGO di NASCITA: (place of birth) ....

INDIRIZZO PERMANENTE: (home address) ....

NAZIONALITA': (nationality) ....

NOMINATIVO: (call sign) ....

SOGGIORNO in ITALIA: (stay in Italy) dal (from) .... al (to) ....

INDIRIZZO TEMPORANEO in ITALIA: (temporary address in Italy) ....

INFORMAZIONI SULLA STAZIONE: (informations about the station) ....

Allega alla presente la fotocopia della concessione di radioamatore dello Stato di appartenenza nonchè una marca da bollo da Lire 3.000.-

DATA: (date) ....

Firma (signature) ....

Fig. 1. Application for an Italian temporary license.

MAKE THE RIGHT CONNECTION

The RIGHT CONNECTION for your mobile radio-telephone system is available from CES.

CES — Simply the Right Connection for
- Ingenuity
- Quality
- Reliability
- Service
- Value

Phone Patches
- Full Duplex
- Half Duplex
- VOX Simplex with EVD
- Sampling Simplex

DTMF Keyboard Microphones and DTMF Encoders
- Lighted
- Autodial
- Universal Interface

Interconnect Message Accounting Systems
- EF Johnson Trunking Compatible
- ANI Validation
- Complete Computered Billings

CES

68

Communications Electronics Specialties, Inc.
P.O. Box 2930, Winter Park, Florida 32790
Telephone: (305) 645-0474

1-800-327-9956 (Sales)
1-800-237-0030 (Service Only)

Portugal, Spain, Sweden, Switzerland, Turkey, and U.S.A. Application may be made for another three-month permit, however, and up to four consecutive permits may be granted.

Amateurs intending to remain in Italy for more than a year must first register their residence location and then follow procedures established for Italian nationals.

Applications from abroad may be on plain paper, following the format shown in the box. In Italy, revenue-stamped paper (*carta legale* or *carta da bollo*) must be used. Provide the information in Italian.

Enclose 5,800 lira or IRCs of that value (as of January, an IRC had the nominal value of 650 lira) and a photocopy of your station license, which must be valid for the period for which the temporary permit is requested. (For overseas air mail service, enclose an additional 4,700 lira.) Special delivery or registered mail for the application is recommended.

If the application is sent direct to the Reciprocal Licensing Unit (above address), U.S. $10 *in cash* may be sent instead to cover all expenses. An additional U.S. $5 will pay for the permit, and your receipt will make it unnecessary for you to visit the Italian Ministry of P e T to pay that fee. ***Remember: checks and postal money orders are NOT acceptable.*** It is strongly recommended that permits be obtained before coming to Italy, and that applications be made six to eight weeks in adavnce of your departure.

The callsign you will use in Italy will be your own followed by a slash and the prefix of the Italian call area in which you are operating at that moment.

The Italian licensing administration (to which calls and correspondence should be in Italian) is the Ministero delle Poste e delle Telecomunicazioni, Direzione Centrale dei Servizi Radioelettrici, Divisione 5–Sezione 3, Viale Europa, 160, 1–00100 Roma/Eur Rm, Italy.

Notes on filling out the application: WRITE IN CAPS! (1) Write family name followed by first name and middle name. (2) Write date in numbers. (3) Town, village, and state. (4) Complete home address—as on your amateur license if it is the same. (5) From (in numbers) day/month/year To day/month/year, not to exceed 90 days. (6) Write complete address of the home, hotel, campground, etc., where station will be operated. Note: Mobile service is permitted only on VHF/UHF bands and up, but *do not* specify mobile operations on this form. New regulations are pending. (7) Manufacturer and model of equipment with the rf power (input). For HF bands, input must *not* exceed 300 Watts; for VHF/UHF and up, the input limit is 10 Watts. Specify type(s) of antennas to be used.

CORRECTIONS

An error found its way into VE1VQ's article, "Build a Dynamic Duo," in the February, 1986, issue. The schematic for the cigarette-lighter adapter (formerly Fig. 4) originally showed a short from the base of transistor Q3 to the collector of same. Capacitor C1 (.001 uF) should appear in place of the short. The corrected schematic is shown here in Fig. 1.

In John Coppens' article, "132 Extra Memories For Your FT-107M," published in the March, 1986, issue, transistors T1–T4 should be replaced with BC547s or other suitable NPN transistors.

In the May, 1986, International section, the wrong flag was used with the Republic of China column. *73* regrets the error.

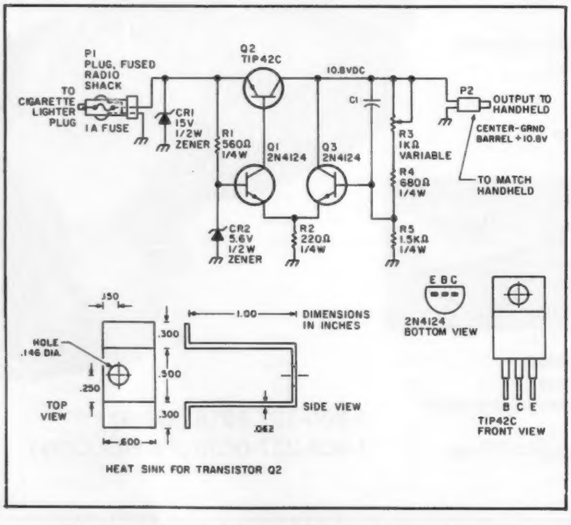


Fig. 1. The corrected cigarette-lighter adapter schematic.

SATELLITES

USING THE AO-10 PREDICTIONS

Apogee predictions for the month of July are provided for three sections of the United States: Washington, D.C.; Denver, Colorado; and Los Angeles, California. Times are in UTC and apogee in this case is mean anomaly 128 rounded to the nearest whole hour. Use the chart as a guide in aiming your antenna, then fine-tune the azimuth and elevation values to peak the satellite's beacon signal. If you require more accurate orbital predictions, contact AMSAT at PO Box 27, Washington DC 20044.

July 1986

		WASH		DENVER		LA	
DAY	TIME	AZ	EL	AZ	EL	AZ	EL
1	1552			213	13	192	25
2	1511	228	4	204	16	192	25
3	1430	221	9	195	19	181	26
4	1349	213	14	185	20	171	26
5	1308	204	17	175	21	160	24
6	1227	195	20	165	19	151	21
7	1146	185	21	156	17	142	16
8	1105	175	22	147	13	135	11
9	1024	165	20	140	9	128	5
10	0943	155	18	131	4		
11	0902	147	14				
12	0821	138	10				
13	0740	131	5				
15	1758					238	0
16	1717					232	6
17	1636			233	7	225	12
18	1555			226	6	217	17
19	1514			219	11	208	22
20	1434	233	1	210	15	199	25
21	1353	226	7	202	19	188	27
22	1312	219	12	192	21	177	28
23	1231	211	16	182	22	167	27
24	1150	202	20	172	22	156	25
25	1109	192	22	162	20	147	21
26	1028	182	23	152	17	147	21
27	0947	171	23	143	13	131	10
28	0906	161	21	135	8	124	4
29	0825	152	18	128	3		
30	0744	143	14				
31	0703	135	9				

★QUALITY PARTS ★DISCOUNT PRICES ★FAST SHIPPING!

SEND FOR FREE 1986 CATALOG... 48 PAGES!

ALL ELECTRONICS CORP.

SOUND AND VIDEO MODULATOR FOR T.I. COMPUTER

T.I. # UM1381-1. Designed for use with T.I. computers. Can be used with video sources. Built-in A/B switch. Channel 3 or 4 selection switch. Operate on 12 vdc. Hook-up diagram included.

CAT# AVMOD WERE $10.00 REDUCED TO $5.00 EACH

SLIM LINE COOLING FAN

Etri $# 99XM182 low noise fan. Measures 3⅝" square x 1" deep. 21 cfm, 23 db, 1700 rpm.

SPECIAL PRICE . . . $12.50 each

2K 10 TURN

MULTI-TURN POT
SPECTROL
#MOD 534-7161
$5.00 EACH

SOLID STATE BUZZER

Star #SMB-06L
6 vdc
TTL compatible.
$1.00 each
10 for $9.00

± 12 Vdc or 24Vdc POWER SUPPLY

DELTRON MODEL QD12/15-1.7
Dual plus and minus 12Vdc open frame power supply. Can be used as 24Vdc @ 1.5 amp. INPUT: either 115 Vac or 230 Vac
Fully regulated computer grade supply.
7" x 4¾" x 2⅜"

$12.50 each 10 for $110.00

EDGE CONNECTORS

ALL ARE 1.56" SPACING.

22 EDGE CONNECTOR $1.25 ea
solder lug style 10 for $11.00

22/44 EDGE CONNECTOR
$2.00 ea P.C. style 10 for $18.00

22/44 EDGE CONNECTOR
solder lug style $2.50 each

28/56 EDGE CONNECTOR
$2.50 ea P.C. style 10 for $22.00

36/72 EDGE CONNECTOR
P.C. style $3.00 each

43/86 EDGE CONNECTOR
P.C. style $4.50 each

TRANSISTORS

2N706	4 for $1.00
2N2222A	3 for $1.00
PN2222A	4 for $1.00
2N2904	3 for $1.00
2N2904	3 for $1.00
2N2905	3 for $1.00
MJ2955	$1.50
2N3055	$1.00
PMD 10K40	$1.00
TIP 121	75¢
TIP 125	75¢

TRANSFORMERS

120 volt primaries

5.6 volts @ 750 ma.	$3.00
6 volts @ 150 ma.	$1.25
6.3 volt @ 600 ma.	$3.00
12 V.C.T. @ 200 ma.	$2.00
12 V.C.T. @ 400 ma.	$3.00
12 V.C.T. @ 1 amp	$4.00
12 V.C.T. @ 2 amp	$4.85
12 V.C.T. @ 4 amp	$7.00
16 volts @ 650 ma.	$3.50
24 V.C.T. @ 200 ma.	$2.50
24 V.C.T. @ 1 amp	$4.85
24 V.C.T. @ 2 amp	$6.75
24 V.C.T. @ 3 amp	$9.50
24 V.C.T. @ 4 amp	$11.00
36 V.C.T. @ 135 ma.	$3.00

WALL TRANSFORMERS

all plug directly into 120 vac outlet

4 VDC @ 70 ma.	$2.00
6 VAC @ 500 ma.	$3.50
6 VDC @ 750 ma.	$4.50
9 VDC @ 500 ma.	$5.00
12.5 VAC @ 265 ma.	$3.00
16 VAC @ 16 VA and 8.5 VAC @ 1.28 VA	$4.50
24 VAC @ 250 ma.	$3.00
MULTI-VOLTAGE @ 500 ma. 3,4½,6,7½,9 or 12 VDC	$7.50

MINI-BOX

Pomona #2104.

$1.00 EACH

Heavy-duty black phenolic project box with cover and screws. 2⅝" X 1½" X 1½".

FUSES

3AG (AGC) SIZE
1, 1½, 2, 2½, 3, 4, 5, 6 AMP
GMA SIZE
1, 2, 3, 4, 5 AMP
5 of any ONE amperage 75¢

SPECIALS

1 AMP 50 VOLT DIODES
IN4001 TAPE AND REEL
100 for $4.50
1000 for $30.00

SOLDER TAIL I.C. SOCKETS
24 PIN 10 for $2.50
100 for $22.00
1000 for $200.00

★SPECIAL PRICE★ TRANSISTOR

plastic transistor
PN3569 TO-92 N.P.N.

100 for $8.00
1000 for $60.00
LARGE QUANTITIES AVAILABLE

MICRO-CASSETTE MECHANISM

Micro-cassette tape transport for standard MC60 or MC45 micro-cassettes. 3 Vdc operation. Contains: drive motor, belt, head, capstan, pinch wheel and other components. 3 1/2" X 2 1/4" X 5/8"

CAT# MCMEC $3.00 each 10 for $27.50

COMPUTER GRADE CAPACITORS

2,000 mfd. 200 Vdc 1 3/4" x 5" high	$2.00
6,400 mfd. 60 Vdc 1 3/8" x 3 3/4" high	$2.50
9,700 mfd. 50 Vdc 1 3/8" x 4 1/2" high	$3.00
31,000 mfd. 15 Vdc 1 3/4" x 4" high	$2.50
50,000 mfd. 40 Vdc 3" x 5 3/4" high	$4.50
66,000 mfd. 15 Vdc 3" X 3 3/4" high	$3.00
60,000 mfd. 40 Vdc 3" x 5" high	$3.50
66,000 mfd. 15 Vdc 3" x 3 3/4" high	$3.00
86,000 mfd. 30 Vdc 3" x 5 1/4" high	$3.50

• $1.00 SPECIALS •

5,500 mfd. 30 Vdc 1 3/8" x 3 1/2" high	$1.00
5,900 mfd. 30 Vdc 1 3/8" x 2 1/4" high	$1.00
9,300 mfd. 50 Vdc 2" x 4 1/2" high	$1.00
18,000 mfd. 10 Vdc 1 3/8" x 2 5/8" high	$1.00
48,000 mfd. 10 Vdc 2 1/2" x 3 1/4" high	$1.00
100,000 mfd. 10 Vdc 2 1/2" x 6" high	$1.00
185,000 mfd. 6 Vdc 2 1/2" x 4 1/2" high	$1.00

RELAYS

10 AMP SOLID STATE

CONTROL: 3 - 32 vdc
LOAD: 140 vac 10 amp
SIZE: 2½" x ¾" x ⅞"

$9.50 EACH 10 FOR $90.00

ULTRA-MINIATURE 5 VDC RELAY

Fujitsu #
FBR211NED005M20
High sensitivity
COIL: 120 ohms
CONTACTS: 1 amp
Mounts in 14 pin DIP socket
$1.25 each 10 for $10.00

MINIATURE 6 VDC RELAY

Aromat #RSD-6V
Super Small
S.P.D.T. relay
GOld colbalt contacts rated 1 amp @ 30 vdc. Highly sensitive, TTL direct drive possible. 120 ohm coil.
Operate from 4.3 – 6 vdc.
COIL: 120 ohms $1.50 each
$1^{3}/_{16}$ x $^{13}/_{32}$" x $^{7}/_{16}$" 10 for $13.50

13 VDC RELAY

CONTACTS: S.P.N.C.
10 amp @ 120 vac
Energize coil to open contact...
COIL: 13 vdc 650 ohms

SPECIAL PRICE $1.00 each

4PDT RELAY

14 pin KH style...
3 amp contacts...
USED but fully tested . . . . $1.70 each
Specify coil voltage desired
Either 24 vdc or 120 vac
LARGE QUANTITIES AVAILABLE

SOCKETS FOR KH RELAY
75¢ each

220 Vac COOLING FAN

ROTRON #
MX77A3
Muffin XL
220 Vac
4 1/8" square metal frame fan.

CAT# CF-220 $6.50 ea
10 for $60.00 / 100 for $500.00
QUANTITIES AVAILABLE

LINE CORDS

TWO WIRE

6' 18/2 SPT-1 flat	3 for $1.00
6' 18/2 SPT-2 flat	2 for $1.00
6' 16/2 SJT round	$1.25 each

THREE WIRE

6' 18/3 flat	$1.50 each
8' 18/3 round	$2.00 each

3½" SPEAKER

8 ohm impedance, Full range speaker. 8 oz magnet 4" diagonal mounting centers.

$2.50 each 10 for $20.00

7 CONDUCTOR RIBBON CABLE

Spectra-strip red marker strip, 28 ga. stranded wire.
$5.00 per 100' roll

SPRING LEVER TERMINALS

Two color coded terminals on a sturdy 2¾" x 3¾" bakelite plate.
Great for speaker enclosures or power supplies.
75¢ EACH 10 for $6.00

XENON FLASH TUBE

3/4" long X 1/8" dia. Flash tube designed for use in compact camera flash units. Ideal for experimentors.
CAT# FLT-1 2 for $1.00

48 KEY ASSEMBLY FOR COMPUTER OR HOBBYIST

NEW T.I. KEYBOARDS. Originally used on computers, these keyboards contain 48 S.P.S.T. mechanical switches. Terminates to 15 pin connector. Frame 4" x 9"
CAT # KP-48 $6.50 each
2 for $11.00

MINIATURE TOGGLE SWITCHES

ALL ARE RATED 5 AMPS @ 125 VAC

S.P.D.T. (on-on)
P.C. style non-threaded bushing.
75¢ each
10 for $7.00

S.P.D.T. (on-on)
Solder lug terminals.
$1.00 each
10 for $9.00
100 for $80.00

S.P.D.T. (on-off-on)
Solder lug terminals.
$1.00 each
10 for $9.00
100 for $80.00

S.P.D.T. (on-off-on)
P.C. style non-threaded bushing
75¢ each
10 for $7.00

S.P.D.T. (on-on)
P.C. lugs threaded bushing.
$1.00 each
10 for $9.00
100 for $80.00

D.P.D.T. (on-on)
Solder lug terminals.
$2.00 each
10 for $19.00
100 for $180.00

TI SWITCHING POWER SUPPLY

Compact, well-regulated switching power supply designed to power Texas Instruments computer equipment.
INPUT: 14 – 25 vac @ 1 amp
OUTPUT: + 12 vdc @ 350 ma.
+ 5 vdc @ 1.2 amp
− 5 vdc @ 200 ma.
SIZE: 4¼" x 4¼" x 1¼" high

★SPECIAL PRICE★ $3.50 each

13.8 VDC REGULATED POWER SUPPLY

These are solid state, fully regulated 13.8 vdc power supplies. Both feature 100% solid state construction, fuse protection, and L.E.D. power indicator. U.L. listed.

2 amp constant, 4 amp surge	$20.00 each
3 amp constant, 5 amp surge	$27.50 each

D.C. CONVERTER

Designed to provide a steady ± 5 vdc @ 240 ma. from a battery supply of 3.5 to 6.25 volts.
$2^{1}/_{16}$" x $1^{1}/_{16}$ x $1^{11}/_{16}$"
$1.50 each

TWIST-LOCK CONNECTOR

Same as Switchcraft #12CL5M.
5 conductor in-line plug and chassis mount jack. Twist-lock style.
$2.50/SET

RECHARGEABLE NI-CAD BATTERIES

AAA SIZE	1.25V 500mAH	$1.85
AA SIZE	1.25V 500mAH	$1.85
AA with solder tab		$2.00
C SIZE	1.2V 1200mAH	$3.50
SUB-C SIZE	solder tab	$3.50
D SIZE	1.2V 1200mAH	$3.50

UNIVERSAL CHARGER

Will charge 4-AA, C, D, or AAA ni-cads or one 9 volt ni-cad at one time...
$11.00 per charger

STANDARD JUMBO DIFFUSED T 1-3/4

RED	10 for $1.50 100 for $13.00
GREEN	10 for $2.00 100 for $17.00
YELLOW	10 for $2.00 100 for $17.00

FLASHER LED

5 volt operation
red jumbo T 1¾ size $1.00 each

NEW GREEN FLASHER
CAT # LED-4G $1.00

BI-POLAR jumbo T 1¾ size
2 for $1.70

LED HOLDERS

Two piece holder for jumbo LED
10 for 65¢ 100 for $5.00

CLEAR CLIPLITE LED HOLDER

Make LED a fancy indicator. Clear.
4 for $1.00

D.P.S.T. LIGHTED ROCKER SWITCH

115 vac lighted rocker, snap mounts in ⅞" x 1⅛" hole.
Orange lens. 16 amp contact.
$1.50

MINI-PUSH BUTTON

S.P.S.T. momentary
normally open
¼" bushing.
Red button.
35¢ each
10 for $3.00

SNAP ACTION SWITCH

Cherry elect. #E-21. N.O. or N.C. 0.1A contacts. Suitable for alarms and other low energy circuits. 1⅛" lever.

45¢ EACH 10 FOR $4.20

ROTARY ACTION MICRO

OMRON #C-5G3-C41
Clockwise action micro used in coin operated mechanisms and low torque operations.
RATED: 5 amps @ 125 Vac.
$1.25 each 10 for $11.00
LARGE QUANTITIES AVAILABLE

ALL ELECTRONICS CORP.
LOS ANGELES, CA STORE
905 S. Vermont Ave.
213 380-8000

VAN NUYS, CA STORE
6228 Sepulveda Blvd.
818 997-1806

MAIL ORDERS TO:
P.O. BOX 20406
Los Angeles, CA 90006

TWX - 5101010163 ALL ELECTRONIC

EASYLINK MBX - 62887748

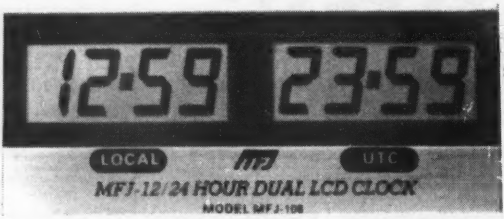
VISA
MasterCard

TOLL FREE ORDERS ONLY
1-800-826-5432
(ORDER ONLY)
(IN CALIFORNIA 1-800-258-6666)
ALASKA, HAWAII,
OR INFORMATION
(213) 380-8000 NO C.O.D.!

QUANTITIES LIMITED
MINIMUM ORDER $10.00
USA: $3.00 SHIPPING
FOREIGN ORDERS:
INCLUDING SUFFICIENT
SHIPPING
CALIF RES. ADD 6½%

BEST OF MFJ

MFJ 24 HOUR LCD CLOCKS



MFJ-108
$19.95

MFJ-107
$9.95

23:59
MFJ-24 HOUR LCD CLOCK
MODEL MFJ-107

These MFJ 24 hour clocks make your DXing, contesting, logging and SKEDing easier, more precise.

Read both UTC and local time at a glance with the MFJ-108, $19.95, dual clock that displays 24 and 12 hour time simultaneously. Or choose the **MFJ-107, $9.95** single clock for 24 hour UTC time.

Both are mounted in a brushed aluminum frame, feature **huge easy-to-see 5/8 inch LCD numerals** and a sloped face that makes reading across-the-shack easy and pleasant.

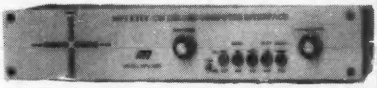
You can read hour, minute, second, month and day and operate them in an alternating time-date display mode. You can also **synchronize them to WWV** for split-second timing. Both are **quartz controlled** for excellent accuracy.

They are **battery operated** so you don't have to reset them after a power failure, and battery operation makes them suitable for mobile and portable use. Long life battery included.

MFJ-108 is 4½x1x2 in. MFJ-107 is 2¼x1x2 in.

RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE

MFJ-1229 $179.95



Everything you need is included for sending and receiving RTTY/ASCII/CW on a Commodore 64 or VIC-20 and your ham rig. You get MFJ's most advanced computer interface, software on tape and all cables. Just plug in and operate.

The MFJ-1229 is a general purpose computer interface that will never be obsolete. An internal DIP switch, TTL and RS-232 ports lets you adapt the MFJ-1229 to nearly any home computer and even operate AMTOR with appropriate software.

A crosshair "scope" LED tuning array makes accurate tuning fast, easy and precise.

You can transmit both narrow (170 Hz) and wide (850 Hz) shift while the variable shift tuning lets you copy any shift (100-1000 Hz) and any speed (5-100 wpm, 0-300 baud ASCII).

Automatic threshold correction and sharp multi-pole active filters give good copy under severe QRM, weak signal and selective fading.

There's an FM (limiting) mode for easy trouble-free tuning that's best for general use and an AM (non-limiting) mode that gives superior performance under weak signals and heavy QRM.

A handy Normal/Reverse switch eliminates retuning while checking for inverted RTTY.

An extra sharp 800 Hz CW filter really separates the signals for excellent copy.

12½ x 12½ x 6 inches. Uses floating 18 VDC or 110 VAC with MFJ-1312, $9.95.

MFJ PORTABLE ANTENNA

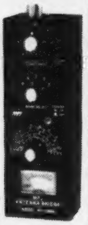
MFJ's Portable Antenna lets you operate 40, 30, 20, 18, 15, 12, 10 meters from apartments, motels, camp sites, vacation spots, any electrically clear location where space for full size antenna is a problem.

A telescoping whip (extends 54 in.) is mounted on self-standing 5½ x 6¾ x 2¼ inch Phenolic case. Built-in antenna tuner, field strenght meter. 50 feet coax. Complete multi-band portable antenna system that you can use nearly anywhere. 300 watts PEP.

MFJ-1621
$79.95

MFJ ANTENNA BRIDGE

MFJ-204B $79.95



Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge that you can take to your antenna site—no other equipment is needed.

You can determine if your antenna is too long or too short, measure its resonant frequency and antenna resistance to 500 ohms. It's the easiest and most convenient way to determine antenna performance available today to anyone. There's nothing else like it and only MFJ has it. Built-in resistance bridge, null meter and tunable oscillator-driver (1.8-30 MHz). Uses 9 V battery. 4 x 2 x 2 inches.

REMOTE ACTIVE ANTENNA

The authoritative "World Radio TV Handbook" rates the MFJ-1024 as "a first-rate easy-to-operate active antenna ... Quiet, with excellent dynamic range and good gain ... Very low noise factor ... Broad frequency coverage ... the MFJ-1024 is an excellent choice in an active antenna".

54 inch remote active antenna mounts outdoor away from electrical noise for maximum signal and minumum noise pickup. Often outperforms long-wire hundreds of feet long. Mount anywhere-atop houses, buildings, balconies, apartments, ships.

Use with any radio to receive strong clear signals from all over the world. 50 KHz to 30 MHz. High dynamic range eliminates intermodulation. Inside control unit has 20 dB attenuator, gain control. Switch 2 receivers and auxiliary or active antenna. "On" LED. 6 x 2 x 5 in. 50 ft. coax. 12 VDC or 110 VAC with MFJ-1312, $9.95.

MFJ-1024
$129.95

200 WATT VERSA TUNER

MFJ-901B $59.95

MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier. Efficient air-wound inductor gives more watts out. 4:1 balun, 5x2x6 in.

ROLLER INDUCTOR TUNER

MFJ-989 $329.95

Meet the "Versa Tuner V", the compact roller inductor tuner that lets you run up to 3 KW PEP and match everthing from 1.8 to 30 MHz.

Designed to match the new smaller rigs, the MFJ-989 is the best roller inductor tuner produced by MFJ. Our roller inductor tuner features a 3-digit turn counter plus a spinner knob for precise inductance control for maximum SWR reduction. Just take a look at all these other great features! **Built-in 300 watt, 50 ohm dummy load, built-in 4:1 balun and a built-in lighted meter** that reads SWR and forward and reflected power in 2 ranges (200 and 2000 watts). Accuracy ±10% full scale. Meter light requires 12 VDC. 6 position antenna switch. 10¾ x 4½ x 15 inches.

MFJ "DRY" DUMMY LOADS

MFJ-262
$64.95

MFJ-260
$26.95

MFJ's "Dry" dummy loads are air cooled—no messy oil. Just right for tests and fast tune up. Non-inductive 50 ohm resistor in aluminum housing with SO-239. Full load to 30 seconds, de-rating curve to 5 minutes. **MFJ-260 (300 watt),** SWR 1.1:1 to 30 MHz, 1.5:1, 30-160 MHz, 2½x2½x7 in. **MFJ-262 (1 KW),** SWR 1.5:1 to 30 MHz, 3x3x13 inches.

MFJ ELECTRONIC KEYER

MFJ-407
$69.95

MFJ-407 Deluxe Electronic Keyer sends iambic, automatic, semi-auto or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8 to 50 WPM. Speed, weight, tone, volume controls. On/Off, Tune, Semi-auto switches. Speaker. RF proof. 7 x 2 x 6 inches. Uses 9 V battery, 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, $9.95.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT SATISFIED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (less shipping).
- One year **unconditional** guarantee
- Made in USA
- Add $5.00 each shipping/handling
- Call or write for free catalog, over 100 products.

MFJ

✓89

MFJ ENTERPRISES, INC.
Box 494, Mississippi State, MS 39762

TO ORDER OR FOR YOUR NEAREST DEALER, CALL TOLL-FREE

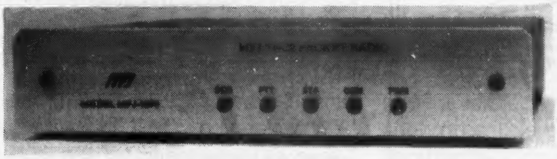
800-647-1800

Call 601-323-5869 in Miss. and outside continental USA Telex 53-4590 MFJ STKV

VISA
MasterCard

AFFORDABLE PACKET RADIO FROM MFJ

An identical TAPR TNC 2 clone with a new cabinet and added features ... for an incredible $129.95!



MFJ-1270

$129.95

Join the exciting packet radio revolution and enjoy error-free communications ... for an incredible $129.95!

MFJ brings together efficient manufacturing and TAPR's (Tucson Amateur Packet Radio) leading edge technology to bring you affordable packet radio. You get a nearly identical clone of the widely acclaimed TAPR TNC 2 with identical software and hardware. It's in a new cabinet and includes a TTL serial port for extra versatility.

All you need is your rig, home computer with a RS-232 serial port and a terminal program. If you have a Commodore 64, 128 or VIC-20 you can use MFJ's optional Starter Pack to get on the air immediately. You get interfacing cable, terminal software on tape or disk and complete instructions ... everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), $19.95 each.

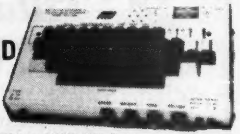
Unlike machine specific TNCs, you never have to worry about your MFJ-1270 being obsolete because you change computers or because packet radio standards change. You can use any computer with an RS-232 serial port and an appropriate terminal program. If packet radio standards change, software updates will be made available as TAPR releases them. Also speeds in excess of 56K bauds are possible with a suitable external modem! Try that with a machine specific TNC or one without hardware HDLC as higher speeds come into widespread use. You can also use the MFJ-1270 as an inexpensive digipeater.

It features the latest AX.25 Version 2.0 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, 16K RAM, simple operation plus more.

Join the packet radio revolution now and help make history. Order the MFJ-1270 today.

Here are MFJ's latest and hottest products for improving your station's performance.

SUPER KEYBOARD



MFJ-496

$169.95

Price slashed 50% to $169.95! Get a full feature Super Keyboard that sends CW/RTTY/ASCII for the price of a good memory keyer.

You get the convenience of a dedicated keyboard—no program to load—no interface to connect—just turn it on and it's ready to use.

This 5 mode Super Keyboard lets you send CW, Baudot, ASCII, use it as a memory keyer and for Morse Code practice. You get text buffer, programmable and automatic message memories, error deletion, buffer preload, buffer hold.

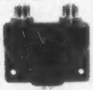
TRIPLE OUTPUT LAB POWER SUPPLY **MFJ-4002 $149.95**

Lab quality power supply gives you plenty of voltage and current for all your analog and digital circuits. **3 completely isolated outputs**: 2 variable 1.5-20 VDC at 0.5 amp and a fixed 5 VDC at 1 amp. Connect in series or parallel for higher voltage and current. It's short circuit protected, has excellent line (typ.0.01%/V) and load regulation (typ.0.1%). **Lighted meters** monitor volt./cur. 12x3x6 in. 110 VAC.

CROSS-NEEDLE SWR/WATT METER **MFJ-815 $59.95**

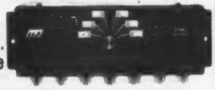
MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance! SWR is automatically computed—no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected and 1:1 to 1:5 SWR on easy-to-read two color scale. Lighted meter. Needs 12 V. ±10% full scale accuracy. 6½ x 3¼ x 4½ inches.

2 KW COAX SWITCHES



MFJ-1702

$19.95



$29.95 MFJ-1701

Instantly select any antenna or rig by turning a knob. Organizes coax cables and eliminates plugging and unplugging. Unused terminals are grounded to protect your equipment for stray RF, static and lightning. 2 KW PEP, 1 KW CW. For 50 to 75 ohm. Negligible loss, SWR, and crosstalk gives high performance. SO-239s. Convenient desk or wall mounting.

MFJ-1702, $19.95. 2 positions. Cast aluminum cavity construction gives excellent performance up to 500 MHz with better than 60 dB isolation at 450 MHz. Heavy duty, low loss switch has less than 20 milliohm contact resistance, less than 0.2 dB loss and SWR below 1:1.2. 2 x 2½ x 1 inches.

MFJ-1701, $29.95. 6 positions. White markable surface for recording ant. positions. 8½ x 1½ x 3 in.

ANTENNA CURRENT PROBE **MFJ-206 $79.95**

This new breakthru MFJ Antenna Current Probe lets you monitor RF antenna currents—no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- **Indicate transmission line radiation** due to high SWR, poor shielding or antenna unbalance.
- **Detect re-radiation** from rain gutters and guy wires that can distort antenna field patterns.
- **Detect RF radiation** from ground leads, power cords or building wiring that can cause RFI.
- **Determine if ground** system is effective.
- **Pinpoint RF leakage** in shielded enclosures.
- **Locate the best place** for your mobile antenna.
- **Use** as tuned field strenght meter.

Monitors RF current by sensing magnetic field. Uses an electrostatically shielded ferrite core, FET RF amplifier, op-amp meter circuit for excellent sensitivity, selectivity. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strenght meter. 4 x 2 x 2 inches.

MFJ's Best VERSA TUNER

MFJ-949C $149.95

MFJ's best 300 watt tuner is now even better!

The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale.

Run up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Tune out SWR on dipoles, vees, long wires, verticals, whips, beams/quads. 10x3x7 in.

DIGITAL SWR/WATTMETER

MFJ-818

$89.95

Fully automatic Digital SWR/Wattmeter reads SWR 1:1 to 1:9.9 directly and instantaneously—no SWR knob to set. Huge 0.6 inch bright orange digits make across-the-room reading easy. 12 segment LED bar graph wattmeter gives instantaneous PEP readings up to 200 watt RF output.

Good, bad, mismatch tri-color LEDs indicate SWR conditions. Small size (5½ x 4¼ x 1 in.) and easy-to-read digital display makes it ideal for mobile use. For 50 ohm systems. 1.8-30 MHz. 12 VDC or 110 VAC with MFJ-1312, $9.95.

MOBILE ANTENNA MATCHER

MFJ-910 $19.95

MFJ MOBILE ANTENNA MATCHER

Lower your SWR and Get more power into your mobile whip for solid signals and more QSOs. Your solid state rig puts out more power and generates less heat. For 10-80 meter whips. Easy plug-in installation. Complete instructions. Fits anywhere, 2½x2½in.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT SATISFIED RETURN WITHIN 30 DAYS FOR PROMPT REFUND (less shipping).
- One year **unconditional** guarantee
- Add $5.00 each shipping/handling
- Call or write for free catalog, over 100 products.

MFJ

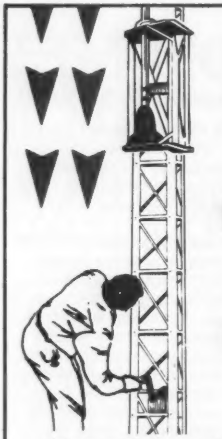
MFJ ENTERPRISES, INC.
Box 494, Mississippi State, MS 39762

TO ORDER OR FOR YOUR NEAREST DEALER, CALL TOLL-FREE

800-647-1800

Call 601-323-5869 in Miss. and outside continental USA Telex 53-4590 MFJ STKV

VISA MasterCard



SAVE TIME and MONEY with THE HAZER

Bring things down for safety and convenience.

Never climb your tower again with this elevator system. Antennas and rotator mount on HAZER, complete system trams tower in verticle upright position. Safety lock system operates while raising or lowering. Never can fall.

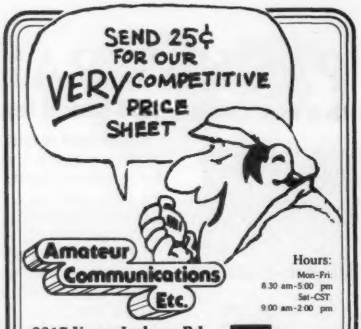
Complete kit includes winch, 100 ft. of cable, hardware and instructions. For Rohn 20 and 25 G Towers.

Hazer 2 - Heavy duty alum. 12 sq. ft. load	$297.00 ppd.
Hazer 3 - Standard alum. 8 sq. ft. load	$213.00 ppd.
Hazer 4 - Heavy galv. steel 16 sq. ft. load	$278.00 ppd.
Ball Thrust bearing TB-25 for any of above	$42.50 ppd.

Martin also mfgs. aluminum towers specifically engineered for use with the HAZER. Two sizes - M-13 (13" wide) and M-18 (18" wide). Also a truly self-supporting galvanized steel tower. Send for free details.

Satisfaction guaranteed. Call today and charge to Visa, MasterCharge or mail check or money order.

GLEN MARTIN ENGINEERING INC.
P.O. BOX 7 253
Boonville, Mo. 65233
816-882-2734


SEND 25¢ FOR OUR VERY COMPETITIVE PRICE SHEET
Amateur Communications Etc.

Hours:
Mon-Fri:
8:30 am-5:00 pm
Sat-CST:
9:00 am-2:00 pm

2317 Vance Jackson Rd
San Antonio TX 78213
(512) 734-7793

VISA

✓3

SYNTHESIZED
SIGNAL GENERATOR

MADE IN USA

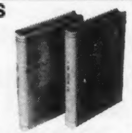
MODEL SG-100F
$429.95 delivered

• Covers 100 MHz to 199.999 MHz in 1 kHz steps with thumbwheel dial • Accuracy +/− 1 part per 10 million at all frequencies • Internal FM adjustable from 0 to 100 kHz at a 1 kHz rate • External FM input accepts tones or voice • Spurs and noise at least 60 dB below carrier • Output adjustable from 5-500 mV at 50 Ohms • Operates on 12 Vdc @ ½ Amp • Available for immediate delivery • $429.95 delivered • Add-on accessories available to extend freq range, add infinite resolution, AM, and a precision 120 dB attenuator • Call or write for details • Phone in your order as fast COD shipment.

✓79

VANGUARD LABS
196-23 Jamaica Ave., Hollis, NY 11423
Phone: (718) 468-2720 Mon.–Thurs.

COMPUTER PROGRAMS AID IN RADIO FREQUENCY DESIGN



The RF Notes series of Design Aid programs can help in solving every day RF Engineering problems. Intended as inexpensive tools, these programs aid in circuit design as well as serve as a powerful source reference material.

RF Notes 1 (*For Commodore C-64/128, SX-64, and IBM PC, PCXT, PCAT, PCjr.*) This program can aid in Mixer Cross-Product evaluations, Resonant Circuit design, Filter design, Microstrip and stripline design and more. **Price for C-64 is $60.00. For IBM the price is $60.00.**

RF Notes 2 (*For IBM PC, PCXT, PCAT, PCjr. only*) will assist in Impedance Matching circuit design, Inductor design (including Toroids), Capacitor evaluation, Attenuator Pad design and more. **Price is $70.00**

RF Notes 3 (*For IBM PC, PCXT, PCAT, PCjr. only*) This program is a very powerful aid to the design of Butterworth response Filters. Low Pass, High Pass, Band Pass, and Band Reject configurations out to the 7th order are covered. Provides circuit constants, schematic diagrams, and much more. **Price is $85.00.**

Add $3.00 each shipping & handling. The IBM environment is PC DOS 2.1, Graphics card required. Write or call for FREE brochure:

ETRON ✓76

Etron RF Enterprises
P.O. Box 4042,
Diamond Bar, CA.
91765 • 714-594-8741

Crystal Filters

For most Ham Rigs from:
KENWOOD - YAESU - HEATHKIT

Also DRAKE R-4C/7 Line, COLLINS 75S3-B/C and ICOM FL-44A, 52A & 53A clones.

Finest 8-pole Construction
ALL POPULAR TYPES IN STOCK
CW - SSB - AM
Phone for information or to Order.
VISA/MC or COD accepted.

FOX-TANGO Corp.
Box 15944, W. Palm Bch, FL 33416
Telephone: (305) 683-9587 ✓58
European Agent: INGOIMTEX, Post Fach 2449, D8070 Ingolstadt, West Germany

---

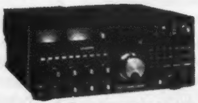
Dan's Got It All

IC-751

IC-745

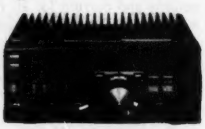
ICOM

IC-02A



FT-980 CAT

YAESU



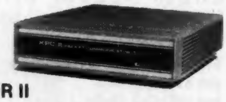
FT-757 GX

FT-209 RH

TM-2570A

PAKRATT PK-64

KANTRONICS
KPC-2
PACKET
COMMUNICATOR II



TS-930S

KENWOOD
TR-2600 TH-21A

TH-21AT

TS-940S

WELZ CORP.
VSWR/POWER METERS

SANTEC
ST-200ET
ST-400ET

Britt's 2-Way Radio Sales & Service

2508 Atlanta Street
Smyrna, Georgia 30080
Belmont Hills Shopping Center
(404) 432-8006

All Of These "Goodies" And Many More At Super Savings.
Come See Us Or Call 1-800-241-2027.

✓90

Ham Awards

Ten American Districts Award

by William V. R. Smith N6MQS

With this issue of *73*, I am pleased to present the first of a series of articles about the many awards available to ham radio operators. Along with information about the rules and requirements of each award, I will present award forms, or worksheets, to help you keep track of your contacts.

Ham awards are presented by clubs and associations to recognize operating achievement. There are many types of awards for all levels of achievement. No matter what your license class, or the amount of time you devote to ham radio, there *is* an award for you.

A Novice can spend a month contacting stations in each of the ten American call districts. A General-class operator tries to work all states during a 48-hour contest.

If you've earned an award, then you know the pride felt when it finally arrives in the mail. If you are working for your first award, just keep working—it's worth the effort!

Many awards have special endorsements. An endorsement is awarded in recognition of a special operating achievement. CW-only, single-band, OSCAR, QRP, RTTY, and SSTV are examples of special achievement. The same award may be earned many times with different endorsements.

When you apply for an award, you must submit proof of contact with the required stations. Proof is most often considered to be valid QSL cards from each of the stations contacted. You may be required to send the QSL cards along with the application. (If you want the cards returned, you must send sufficient postage with your application.)

Some clubs will accept a verified list instead of QSL cards. Each club has its own rules about what constitutes a verified list. Most often a list showing callsign, date, time, mode, and frequency is sufficient, provided it has been checked by two other ham operators or a club official.

A fee is often charged for each award. This covers the cost of printing and the postage to send you the award.

I'll start this series of articles with a relatively easy award: The Ten American Districts Award (TAD), sponsored by the Lockheed E.R.C. Amateur Club (W6LS).

The TAD Award requires contacts with operators in each of the ten U.S. call districts. This award is available to all licensed amateur radio operators and clubs. DX stations are also welcome.

The TAD Award requirements are very broad and are listed below, along with the correct mailing address. With this award, you have a choice of sending your QSL cards or using a verified list. Make a note on the application if you want a special endorsement.

I have created a TAD award for you to use as your verified list. You may use this form even if you send in your QSL cards.

The award fee is very reasonable—one dollar with a verified list or two dollars with QSL cards (to cover return postage). DX stations must add one dollar for the increased postage. Cash, check, IRCs, or U.S. stamps are accepted.

Mail your application, along with payment, by regular mail. The TAD Awards are processed by the 19th day of each month.

73 and I hope to work you on the air. I'll be back next month to feature another award. Good luck with the TAD Award.

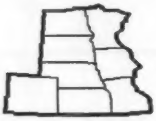
Ten American Districts Award Requirements:

- Contacts with all ten American districts must have been made from the same call area.
- Hawaii counts as the 6th call district.
- Alaska counts as the 7th call district.
- Contacts can be made to and/or from fixed, mobile, portable, or fixed-portable stations.
- Crossband and crossmode contacts are allowed.
- If your callsign changes, contacts made using your previous callsign are still valid as long as they are from the same call area. Your present callsign will appear on the award unless you request otherwise.

Mail your application to:

Amateur Radio Station W6LS
2814 Empire Avenue
Burbank CA 91504

Ten American Districts Award



0

Station Call	Frequency	Mode	Date	Time	S Report R	

1

Station Call	Frequency	Mode	Date	Time	S Report R	

2

Station Call	Frequency	Mode	Date	Time	S Report R	

3

Station Call	Frequency	Mode	Date	Time	S Report R	

4

Station Call	Frequency	Mode	Date	Time	S Report R	

5

Station Call	Frequency	Mode	Date	Time	S Report R	

6

Station Call	Frequency	Mode	Date	Time	S Report R	

7

Station Call	Frequency	Mode	Date	Time	S Report R	

8

Station Call	Frequency	Mode	Date	Time	S Report R	

9

Station Call	Frequency	Mode	Date	Time	S Report R	

Station Call ____________
Name ____________
Address ____________
____

I have reviewed the QSL cards and hereby validate.

____
Signature Call Sign

____
Signature Call Sign

Mail to: Amateur Radio Station W6LS • 2814 Empire Avenue • Burbank, Ca 91504, USA

Kantronics UTU-XT

MARK
SPACE
UTU-XT
Kantronics

NOW — for ANY computer, the intelligent terminal unit that can change its spots.

Can you imagine a terminal unit (TU) that has user programmable parameters? Would you like to be able to vary the MARK and SPACE tones you use by computer control, save these parameters for next time, and be able to change the center frequency and bandwidth of the CW detector? All this can be done with the **Universal Terminal Unit-XT by Kantronics.**

Imagine a **CW/RTTY/ASCII/AMTOR** machine that operates with a TNC-like command structure, including **54 commands.** The UTU-XT does just that with a 6303 microcomputer, 2K of RAM, NOVRAM, and 128K of EPROM embedded inside.

UTU-XT is also compatible to any computer with an RS232 or TTL (C-64) serial port — the circuit is built in. This allows you the flexibility to change computers at any time.

UTU-XT operates CW from 6-99 WPM, RTTY from 45 to 300 baud. ASCII from 110 to 300 baud, and AMTOR modes A, B, and L. Selective RTTY and SELFEC are included.

Suggested retail $359.95

Kantronics

1202 E. 23rd Street (913) 842-7745
Lawrence, Kansas 66046

✓56

---

here is the next generation Repeater

MARK 4CR

The only repeaters and controllers with REAL SPEECH!

No other repeaters or controllers match Mark 4 in capability and features. That's why Mark 4 is the performance leader at amateur and commercial repeater sites around the world. Only Mark 4 gives you Message Master™ real speech • voice readout of received signal strength, deviation, and frequency error • 4-channel receiver voting • clock time announcements and function control • 7-helical filter receiver • extensive phone patch functions. Unlike others, Mark 4 even includes power supply and a handsome cabinet.

Call or write for specifications on the repeater, controller, and receiver winners.

Create messages just by talking. Speak any phrases or words in any languages or dialect and *your own voice* is stored instantly in solid-state memory. Perfect for emergency warnings, club news bulletins, and DX alerts. Create unique ID and tail messages, and the ultimate in a real speech user mailbox — only with a Mark 4.

MARK 4CR REPEATER

MICRO CONTROL SPECIALTIES

Division of Kendecom Inc.
23 Elm Park, Groveland, MA 01834 (617) 372-3442 ✓26

GLB TNC2A PACKET CONTROLLER

GLB Electronics - the first commercial producer of packet controllers joins the "TAPR Revolution" to bring you the GLB Model TNC2A Kit. This kit is the latest TAPR design and is supplied with top quality components. The GLB TNC2A is backed by over 14 years of experience in amateur radio kit products and our technical staff is available to assist you daily from 1 to 3 PM Eastern time.

GLB Model TNC-2A Kit

GLB
TNC2-A
PACKET RADIO CONTROLLER

FEATURES

- AX.25 Version 2.0 Software
- Terminal baud rates - 300,1200, 2400, 4800, 9600
- Multiple connects - up to 10 stations
- Date/time stamping
- Standard DB25 for RS232 connection
- Simple radio hookup
- Radio modem w/built-in counter for calibration
- Low power CMOS option
- Tuning indicator socket for HF & satellite work
- Modem disconnect for future options
- Lithium battery backup for RAM

Hardware
Software
Documentation
by TAPR

Model TNC2A Kit NMOS	$154.95
Model TNC2A Kit CMOS	$169.95

SPECIFICATIONS

CPU	- Z80A microprocessor
Clock	- 2.4576 Mhz standard, 4.9152 Mhz available
Memory	- 32K EPROM, 16K RAM standard
HDLC	- Packets are controlled by hardware for maximum performance permitting full duplex operation
Modem	- 1200 baud, Bell 202 compatible (standard) easily configured for 300 baud/200 Hz shift for HF use
Serial	- Computer/Terminal port is industry standard RS-232-C compatible for use with most equipment
Radio	- Watchdog timer for channel protection transmits audio levels adjustable for nearly any radio. Wide dynamic range demodulator. Channel busy input (RF-DCD) to inhibit packet transmissions on a shared channel.
LEDs	- Power - tells you when power is applied Status - tells you when you have unacknowledged traffic in your buffers Connect - tells you when you are in the error-free mode DCD - tells you when your TNC2A senses other activity on the channel PTT - tells you when your TNC2A keys the transmitter
Power	- +10 to +15 VDC CMOS-110 ma NMOS-260 ma Typical

Quantity discount schedule:

1-2 pcs -	net
3-4 pcs -	7%
5-9 pcs -	10%
10 & up -	15%

Shipping weight - 4 lbs.

✓17

GLB ELECTRONICS,INC.
151 Commerce Pkwy., Buffalo, NY 14224
716-675-6740 9 to 4

DEALER DIRECTORY

Fontana CA

Complete lines—ICOM, Mirage, KLM, Larsen, Astron, B & W. Over 4000 electronic products for the hobbyist. Also CB and business radios. Serving you from a 6000 sq. ft. store. **Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.**

San Jose CA

Bay Area's newest amateur radio store. New & used amateur radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, Santec & many more. **Shaver Radio, Inc., 1775A S. Winchester Blvd., Campbell CA 95008, 370-6665.**

Littleton MA

The reliable ham store serving NE. Full line of ICOM & Kenwood, Drake, Daiwa, B&W accessories. Curtis & Trac keyers. Larsen, Hustler, Telex/Hy-Gain products. Mirage amps., Astron P.S., Alpha Delta protectors. ARRL & Kantronics instruction aids. Whistler radar detectors. Full line of coax fittings. **TEL-COM Electronic Communications, 675 Great Rd. (Rt. 119), Littleton MA 01460, 486-3400/3040.**

Preston ID

Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Call me for all your ham needs. **Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.**

New Castle DE

Factory authorized dealer! Yaesu, ICOM, Ten-Tec, KDK, Kenwood, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. **Delaware Amateur Supply, 71 Meadow Road, New Castle DE 19720, 328-7728.**

Derry NH

Serving the ham community with new and used equipment. We stock and service most major lines: AEA, Astron, B&W, Cushcraft, Encomm, Hy-Gain, Hustler, ICOM, Kenwood, KLM, Larsen, Mirage, Mosley; books, rotors, cable and connectors. Business hours Mon.–Sat. 10–5, Thursday 10–9. Closed Sun./Holidays. **Rivendell Electronics, 8 Londonderry Road, Derry NH 03038, 434-5371.**

DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the October '86 issue must be in our hands by August 1st. Mail to *73 Amateur Radio*, WGE Center, Peterborough, NH 03458. ATTN: Hope Currier.

PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA						20	20					
ARGENTINA	20	20	20	40			20	20	15	15	15	15
AUSTRALIA		20	20	20	40	40	20					
CANAL ZONE	15	40	40	40	40[1]	40		15	15	15	10	10
ENGLAND			40[1]	40			20	20	20	20	20	20
HAWAII			20		40		20					
INDIA												
JAPAN						20	20					
MEXICO	15	40	40	40	40[1]	40		15	15	15	10	10
PHILIPPINES							20					
PUERTO RICO	15	40	40	40	40[1]	40		15	15	15	10	10
SOUTH AFRICA			40	40		20	20				20	
U. S. S. R.							20	20		20		
WEST COAST	20	40	40	40[1]	40[1]	40						20

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA		20	20					20	20			
ARGENTINA	15	20	20	40			20	20		15	15	15
AUSTRALIA	15	20	20	20	40[1]	40		20			20	
CANAL ZONE	15	20	20	20	40[1]	40	20	20	15	15	15*	10
ENGLAND	20	40					20	20		20	20	20*
HAWAII	15	15	20	20	20	40	20	20				
INDIA												
JAPAN		20	20					20	20			
MEXICO	15	20	20	20	40[1]	40	20	20	15	15	15*	10
PHILIPPINES		20	20				20	20				
PUERTO RICO	15	20	20	20	40[1]	40	20	20	15	15	15*	10
SOUTH AFRICA							20				20	20
U. S. S. R.								20			20	

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA		20	20						20			
ARGENTINA	15	20	20	40	40			20	20		15	15
AUSTRALIA		20	20	20	20	40[1]	40[1]		20		15	15
CANAL ZONE	15	15	20	20[1]	40[1]	40		20	20	15	15	15
ENGLAND	20							20	20			20
HAWAII	20	15	15	20	20	20[1]	40[1]	40	20		20	20
INDIA				20					20			
JAPAN		20	20						20			
MEXICO	15	15	20	20[1]	40[1]	40		20	20	15	15	15
PHILIPPINES				20					20			
PUERTO RICO	15	15	20	20[1]	40[1]	40		20	20	15	15	15
SOUTH AFRICA			40						20			
U. S. S. R.									20			
EAST COAST	20	40	40	40[1]	40[1]	40						20

G=Good, F=Fair, P=Poor.

JULY

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G	2 G	3 G	4 G	5 F
6 F	7 F	8 G	9 G–F	10 F	11 F–G	12 F
13 G	14 G	15 G	16 G–F	17 F	18 F–P	19 P
20 P	21 F	22 F	23 F–G	24 G	25 G	26 G
27 G	28 G	29 G	30 F–P	31 P		

TOO GOOD TO BE TRUE?

Advanced Electronic Applications, Inc
PK-64
DCD
PTT
TUNE
THRESHOLD
PAKRATT-64

PAKRATT™ Model PK-64
shown with enhanced
HFM-64 option installed

★ MORSE ★ BAUDOT ★ ASCII ★ AMTOR ★ PACKET ★

FIRST FIVE MODE DATA CONTROLLER

The Pakratt model PK-64 by AEA is the world's first computer interface that offers Morse, Baudot, ASCII, AMTOR *and* Packet all in one box (hardware *and* software included) at a price many competitors charge for Packet alone (from $219.95 Amateur net). Do not let the low price fool you; coming from any other company but AEA it WOULD be too good to be true. The PK-64 works with virtually any voice transceiver. The Pakratt is the easiest of any to hook up and have operating in just a few minutes.

In Packet mode, the PK-64 offers virtually all the features of every other Packet controller on the market, plus many important features left out by others due to cost constraints. For example, we have included a hardware HDLC, true Data Carrier Detect (DCD), multiple connect with up to ten stations simultaneously and full implementation of version 2.0 of the AX.25 protocol.

Because the PK-64 was designed specifically for the Commodore 64 (or C-128 and SX-64) computer, we have been able to do many things not economically feasible with general RS-232 interface controllers. For example, the Pakratt includes true split screen operation with on-screen status indicators and an on-screen tuning indicator.

ENHANCED HFM-64 MODEM OPTION

The standard PK-64 will operate all modes with a phase-lock-loop (PLL) detector roughly equivalent to all popular packet modems in the marketplace (except we have included extra filtering). The enhanced HFM-64 modem option offers true independent dual channel filtering with A.M. detection (like the famous CP-100 Computer Patch™). The enhanced HFM-64 option also offers a hardware LED tuning indicator (like the CP-100) and a front panel variable threshold control for setting maximum sensitivity under various band conditions. We recommend the HFM-64 option for anyone keenly interested in weak-signal heavy-QRM HF operation. For anyone desiring to operate FM RTTY with the standard North American tone pair or CW receive, the HFM-64 is required. The HFM-64 is field installable with no soldering or test equipment required.

WORKS WITH THE POPULAR C-64 COMPUTER

AEA designed the PK-64 around the low-cost C-64 because of the special architecture features making it especially suited to Amateur Radio applications. The C-64 should not be viewed as a mainframe, but rather a very economical accessory to your data communications system. Many owners of expensive computers such as IBM, TANDY, APPLE, KAYPRO, ATARI, etc., are now buying the low cost C-64 and dedicating it to their operating position. They simply cannot find software for their machine that even approaches the power and user friendliness of the PK-64. Plus, think of the convenience of having only one controller and keyboard to go from one mode to another without having to redo cabling!

The PK-64 is so complete that all you need to do is wire up a microphone connector to the end of a cable (provided) and you are ready to go. There is no need to track down special terminal software, cabling or even a power supply. It all comes with the PK-64. So do not be the last on your block to own the most exciting new product in years. See the PK-64 at your favorite dealer or write for our specification sheet now.

Prices And Specifications Subject To Change Without Notice Or Obligation

Advanced Electronic Applications, Inc.
P.O. Box C-2160, Lynnwood, WA 98036-0918
(206) 775-7373 Telex 6972496 AEA INTL UW

AEA Brings you the Breakthrough!

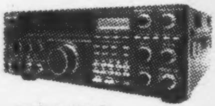
➤65

MISSOURI RADIO CENTER

1-800-821-7323

MasterCard — VISA

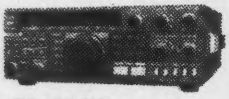
KENWOOD



TS940S "DX-cellence"

- Programmable Scanning
- High Stability, Dual Digital VFO's
- 40 Channel Memory
- General Coverage Receiver

KENWOOD

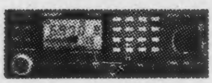


TS-440S "DX-Citing"

- 100% Duty Cycle
- 100 Memories
- Direct Keyboard Entry
- Optional Built-In AT

On Sale Now, Call For Price!

KENWOOD



TM2570 "ALL NEW"

- First 70 Watt FM Mobile
- First With Memory & Auto Dialer
- 23 Channel Memory
- Front Panel Programmable CTCSS

KENWOOD

TR2600 "SPECIAL"

- 2.5 W/300 MW 2 Meter HT
- LCD Readout
- 10 Memories
- Band And Memory Scan

TH-21AT "THE Smallest HT"

- Compact Pocket Size
- 1 Watt
- Optional 500mA Battery

YAESU

FT-757GX "CAT SYSTEM"

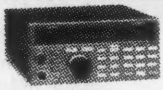
- All Mode Transceiver
- Dual VFO's
- Full Break-in CW
- 100% Duty Cycle

YAESU

FT-2700R "Yaesu gets you there"

- Duo-Band Full Duplex
- 25 Watt
- 144/430 MHz

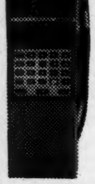
YAESU



FRG-9600

- 60 MHz-905 MHz Continuous
- 100 Memories
- Clock

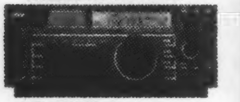
YAESU



FT209RH "Powerful HT"

- 5 Watts
- 10 Memories
- LCD Readout
- Battery Saver

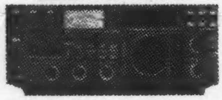
ICOM



IC-735 "NEW"

- HF Transceiver
- Ultra Compact Mobile
- Simplified Front Panel
- Continuously Adjustable output Power up to 100 Watts

ICOM



IC-751A "One Year Warranty"

- 100 KHz - 30 MHz
- FM Standard
- 32 Memories
- QSK (Nominal Speed 40 WPM)

ICOM

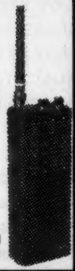
IC-27A "Call for Price"

- 25 Watts
- 32 PL Frequencies
- 9 Memories
- Scanning

ICOM

IC-2AT

- DTMF Pad
- 1.5 Watts
- Thumbwheel freq. selector



IC-02AT

- DTMF Direct Keyboard Entry
- 3 Watts Standard
- 5 Watts Optional

Kantronics

PACKET COMMUNICATOR

- Fully Assembled
- One Year Warranty
- RS-232 Compatible Port

AEA

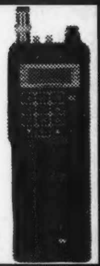
PK-64

- MBA-TOR™
- AMTOR
- Baudot
- ASCII
- Morse
- 300 and 1200 Baud

ALINCO

ALR-206T "More For Your Money"

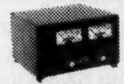
- Completely Programmable From Microphone
- 25 Watt



ALM-203

- 5 Watt
- Subaudible Tone
- 10 Memories
- Built-in "S" meter

ASTRON CORPORATION



Power Supply

- RS7A $48
- RS12A $68
- RS20A $88
- RS20M $105
- VS20M $125
- RS35A $133
- RS35M $149
- VS35M $165
- RS50A $189
- RS50M $215
- RM50A $219
- VS50M $229

Antenna Sale

Hy-Gain On Sale Now			Ken Pro	KR400	$139.00
Hustler 25% Off Mobile				KR500	179.00
Cushcraft				KR5400	299.00
KLM			Alinco	AAZ-7	89.00
Butternut	HF6V	$118.00	Columbia Cable		
	HF2V	$110.00	RG-8X		.15/ft.
AEA	144 Sr.	42.00	RG-8	Super Flex	.28/ft.
Avanti	151.3G	30.00	9913 Type		.39/ft.
			Rotor Cable		.18/ft.
Quatron			H.D. Rotor Cable		.31/ft.

CALL FOR BEST PRICES

QUATRON

AM-6000G - $109.00

- 4 Band Graphic Equalizer
- Power Output Adjust
- VU Meter
- Compressor Amplifier
- Condensor Microphone

"Adaptable to Any Radio"

AEA ALINCO AMERITRON ASTRON AVANTI B&W BENCHER BUTTERNUT COMM SPEC CUSHCRAFT DAIWA

YAESU WELZ VANGORDON SANTEC QUATRON NYE VIKING MIRAGE MFJ LARSEN KLM KENWOOD KENPRO

HUSTLER HYGAIN ICOM

YAESU
COMMUNICATIONS RECEIVER
FRG-8800
MODE
SQUELCH
TONE
AF GAIN

Yaesu has serious listeners for the serious listener.

Yaesu's serious about giving you better ways to tune in the world around you.

And whether it's for local action or worldwide DX, you'll find our VHF/UHF and HF receivers are the superior match for all your listening needs.

The FRG-9600. A premium VHF/UHF scanning communications receiver. The 9600 is no typical scanner. And it's easy to see why.

You won't miss any local action with continuous coverage from 60 to 905 MHz.

You have more operating modes to listen in on: upper or lower sideband, CW, AM wide or narrow, and FM wide or narrow.

You can even watch television programs by plugging in a video monitor into the optional video output.

Scan in steps of 5, 10, 12½, 25 and 100 KHz. Store any frequency and related operating mode into any of the 99 memories. Scan the memories. Or in between them. Or simply "dial up" any frequency with the frequency entry pad.

Plus there's more, including a 24-hour clock, multiplexed output, fluorescent readout, signal strength graph, and an AC power adapter.

The FRG-8800 HF communications receiver. A better way to listen to the world. If you want a complete communications package, the FRG-8800 is just right for you.

You get continuous worldwide coverage from 150 KHz to 30 MHz. And local coverage from 118 to 174 MHz with an optional VHF converter.

Listen in on any mode: upper and lower sideband, CW, AM wide or narrow, and FM.

Store frequencies and operating modes into any of the twelve channels for instant recall.

Scan the airwaves with a number of programmable scanning functions.

Plus you get keyboard frequency entry. An LCD display for easy readout. A SINPO signal graph. Computer interface capability for advanced listening functions. Two 24 hour clocks. Recording functions. And much more to make your listening station complete.

Listen in. When you want more from your VHF/UHF or HF receivers, just look to Yaesu. We take your listening seriously.

✓40

YAESU

Yaesu USA
17210 Edwards Road, Cerritos, CA 90701
(213) 404-2700

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100

Dealer inquiries invited.

Prices and specifications subject to change without notice.
FRG-9600 SSB coverage: 60 to 460 MHz.

KENWOOD

pacesetter in Amateur radio

Here Now! 220 MHz

220: Kenwood Style!

TM-3530A

The first comprehensive 220 MHz FM transceiver

TM-3530A—25 watts of 220 MHz FM—Kenwood style! Features include built-in 7-digit telephone number memory, auto dialer, direct frequency entry and big LCD. All this makes the TM-3530A the most sophisticated rig on 220 MHz!

- **First** mobile transceiver with telephone number memory and auto-dialer (up to 15 seven-digit telephone numbers)
- Frequency range 220-225 MHz
- Automatic repeater offset selection—**a Kenwood exclusive!**
- Direct keyboard entry of frequency
- 23-channel memory for offset, frequency and sub-tone
- Big multi-color LCD and back-lit controls for excellent visibility
- Optional front panel programmable 38-tone CTCSS encoder **includes 97.4 Hz**
- Frequency lock switch
- Digital Channel Link (DCL) option
- **Unique** offset microphone connector—relieves stress on microphone cord
- 16-key DTMF pad, with audible monitor
- Center-stop tuning—**another Kenwood exclusive!**
- **New** 5-way adjustable mounting system
- High performance GaAs FET front end receiver
- HI/LOW power switch (adjustable LOW power)

KENWOOD
TM-3530A
4.980
10

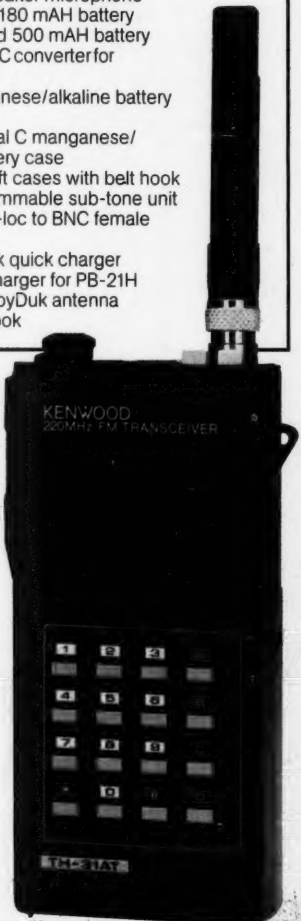
TH-31AT/31A

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

- 1 watt high, 150 mW low
- Super compact and lightweight (about 8 oz. with PB-21!)
- Frequency range 220-224.995 MHz in 5-kHz steps
- Repeater offset:—1.6 MHz, reverse, simplex
- **Supplied accessories:** rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery and wrist strap
- Quick change, locking battery case
- Rugged, high-impact case

TH-31AT/31A optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **BC-6** 2-pack quick charger
- **BC-2** wall charger for PB-21H
- **RA-9A** StubbyDuk antenna
- **BH-3** belt hook



TH-31AT with DTMF pad shown. Optional RA-9A attached.

TM-3530A optional accessories:

- **PS-430** DC power supply
- **TU-7** 38-tone CTCSS encoder
- **MU-1** DCL modem unit
- **VS-1** voice synthesizer
- **PG-2K** extra DC cable
- **PG-3A** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48** extra DTMF mic. with UP/DOWN switch
- **MC-42S** UP/DOWN mic.
- **MC-55** (8 pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50** mobile speaker
- **SW-200B** SWR/power meter
- **SW-100** compact SWR/power meter

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220